FIG. 1A

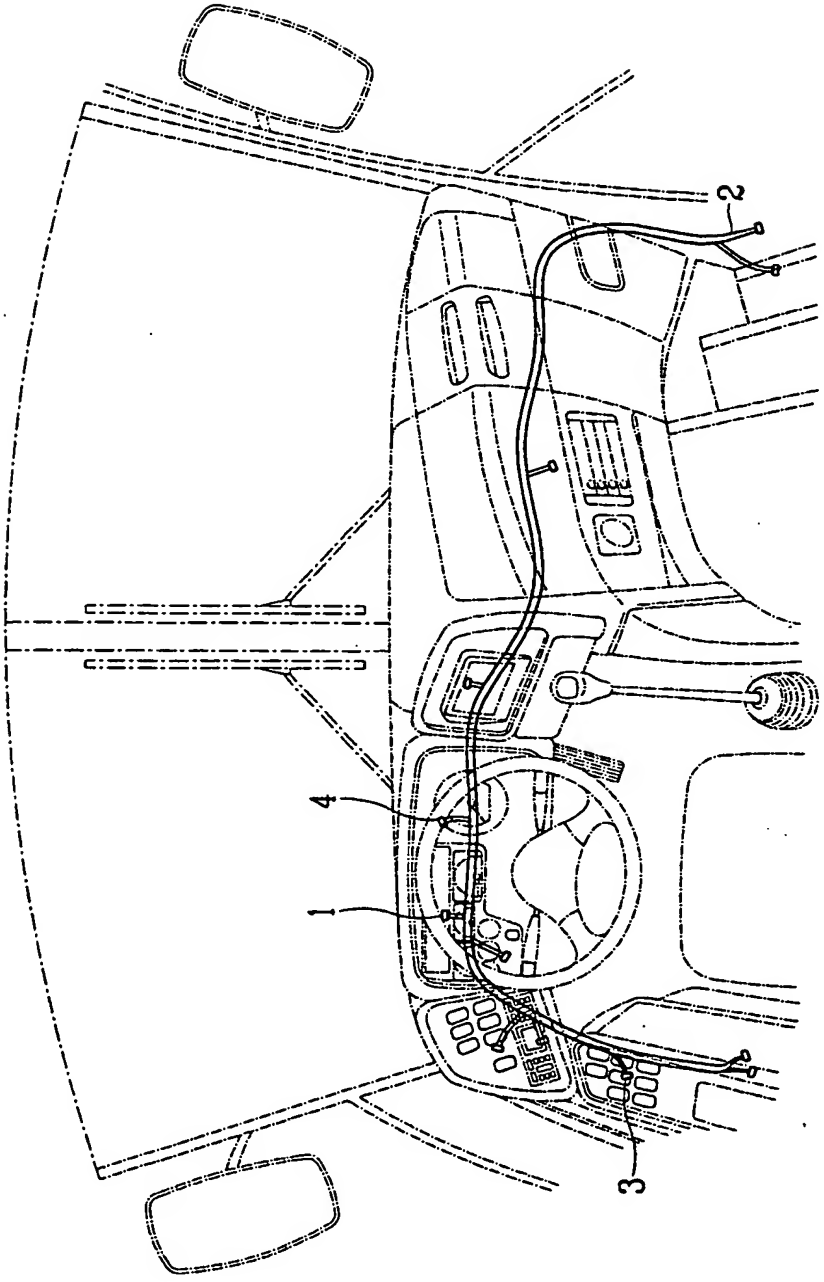


FIG. 1B

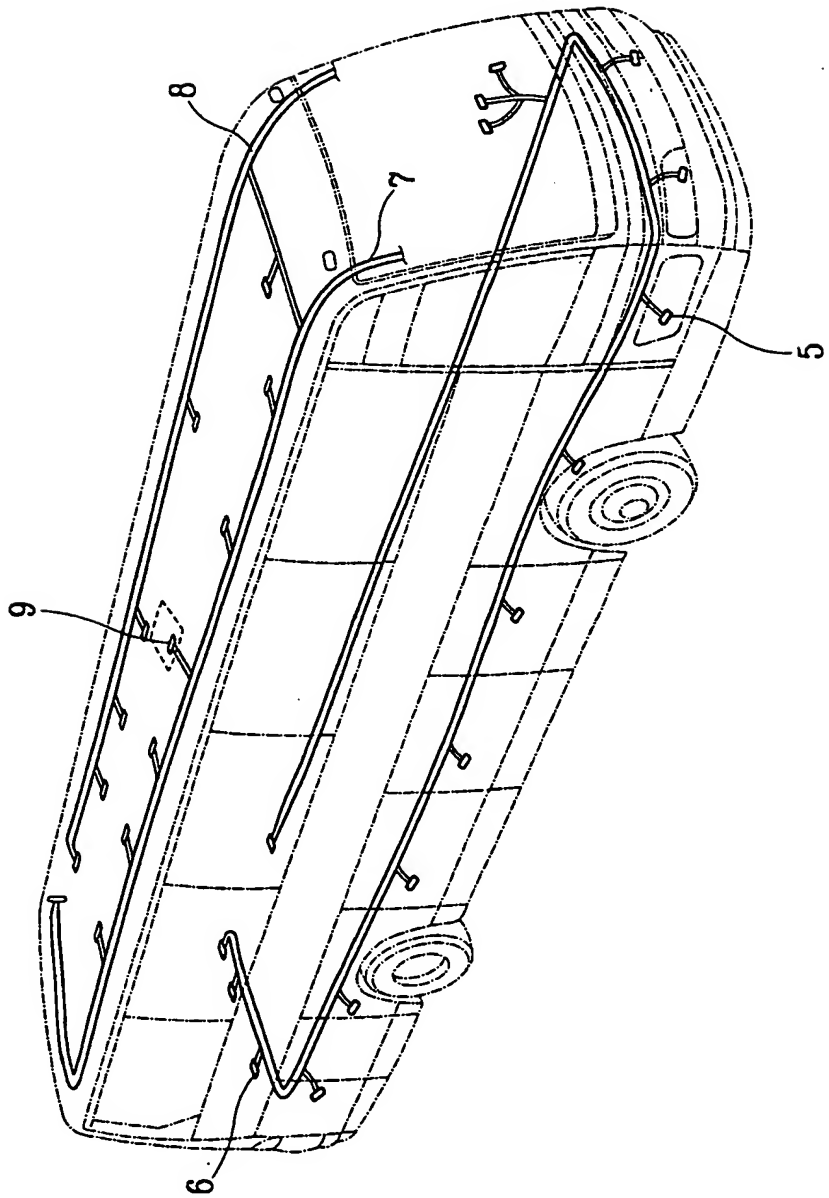


FIG. 2

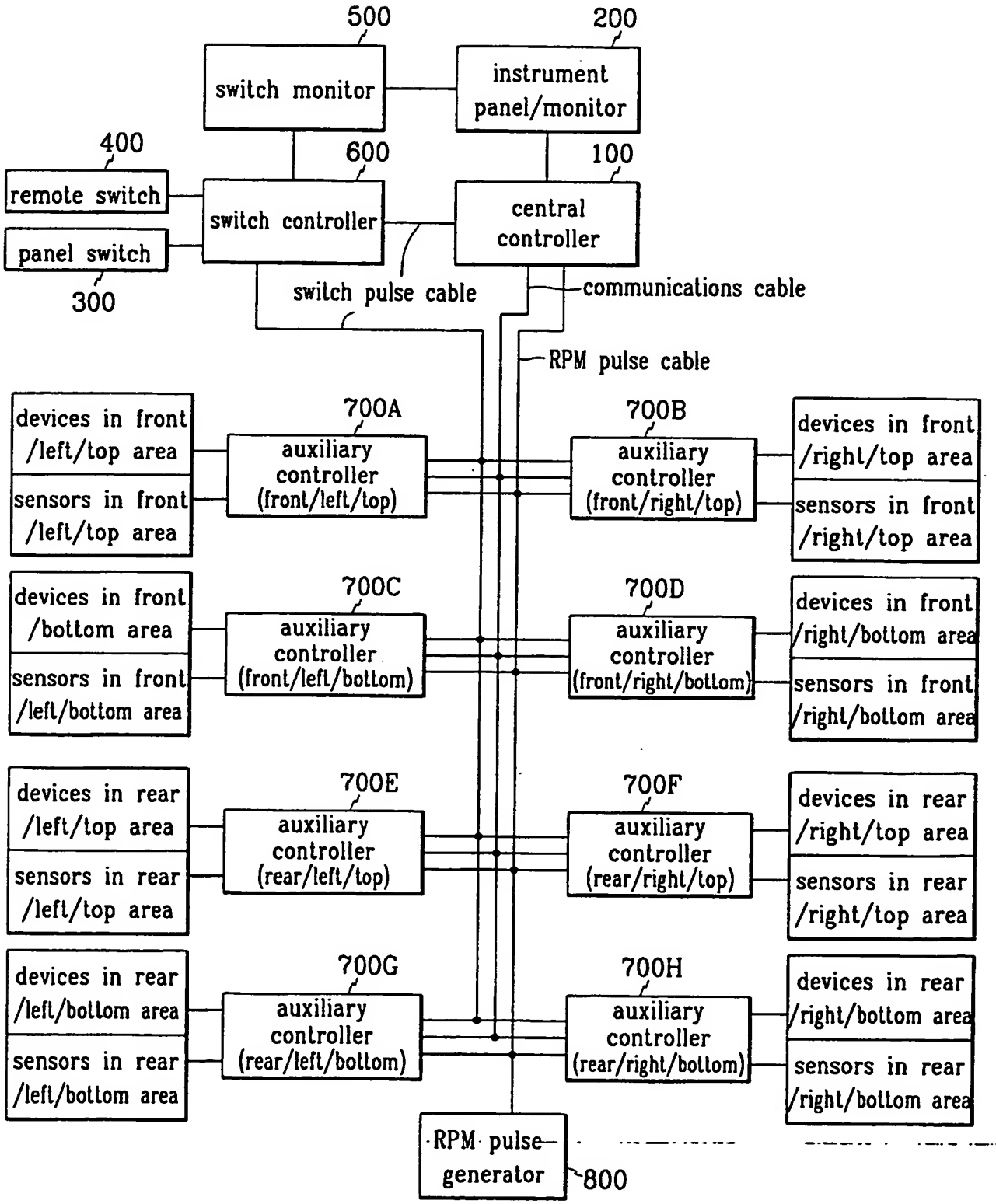

500
switch monitor
200
instrument panel/monitor
400
remote switch
panel switch
300
600
switch controller
100
central controller
switch pulse cable
communications cable
RPM pulse cable
devices in front /left/top area
sensors in front /left/top area
700A
auxiliary controller (front/left/top)
700B
auxiliary controller (front/right/top)
devices in front /right/top area
sensors in front /right/top area
devices in front /bottom area
sensors in front /left/bottom area
700C
auxiliary controller (front/left/bottom)
700D
auxiliary controller (front/right/bottom)
devices in front /right/bottom area
sensors in front /right/bottom area
devices in rear /left/top area
sensors in rear /left/top area
700E
auxiliary controller (rear/left/top)
700F
auxiliary controller (rear/right/top)
devices in rear /right/top area
sensors in rear /right/top area
devices in rear /left/bottom area
sensors in rear /left/bottom area
700G
auxiliary controller (rear/left/bottom)
700H
auxiliary controller (rear/right/bottom)
devices in rear /right/bottom area
sensors in rear /right/bottom area
RPM pulse generator
800

FIG. 3

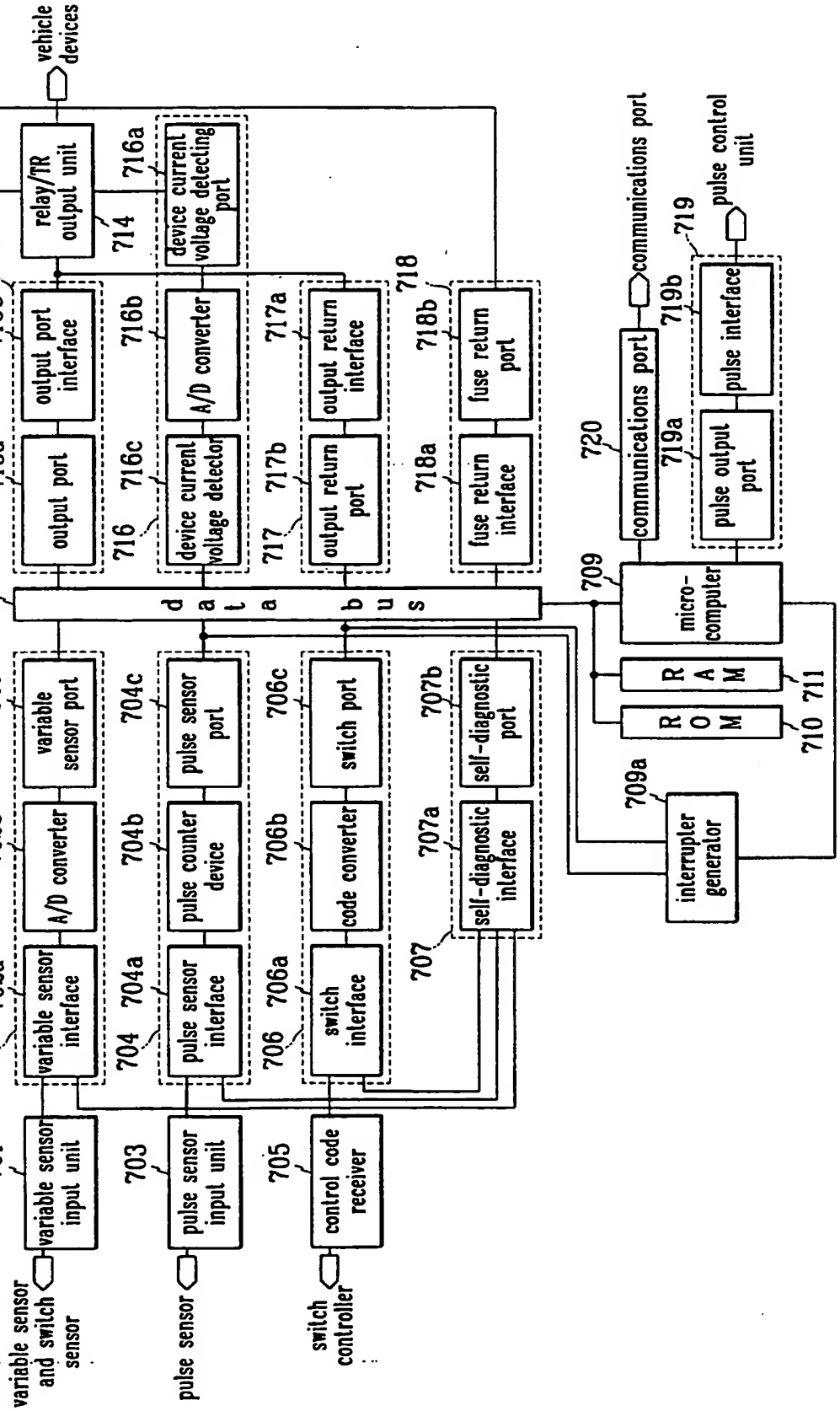

vehicle devices
fuse unit
relay/TR output unit
device current voltage detecting port
power supplier
output port interface
A/D converter
output return interface
fuse return port
electric source (battery)
output port
device current voltage detector
output return port
fuse return interface
communications port
pulse interface
pulse output port
micro-computer
data bus
variable sensor port
pulse sensor port
switch port
self-diagnostic port
A/D converter
pulse counter device
code converter
self-diagnostic interface
variable sensor interface
pulse sensor interface
switch interface
ROM
RAM
interrupter generator
variable sensor input unit
pulse sensor input unit
control code receiver
variable sensor and switch sensor
pulse sensor
switch controller
pulse control unit

FIG. 4

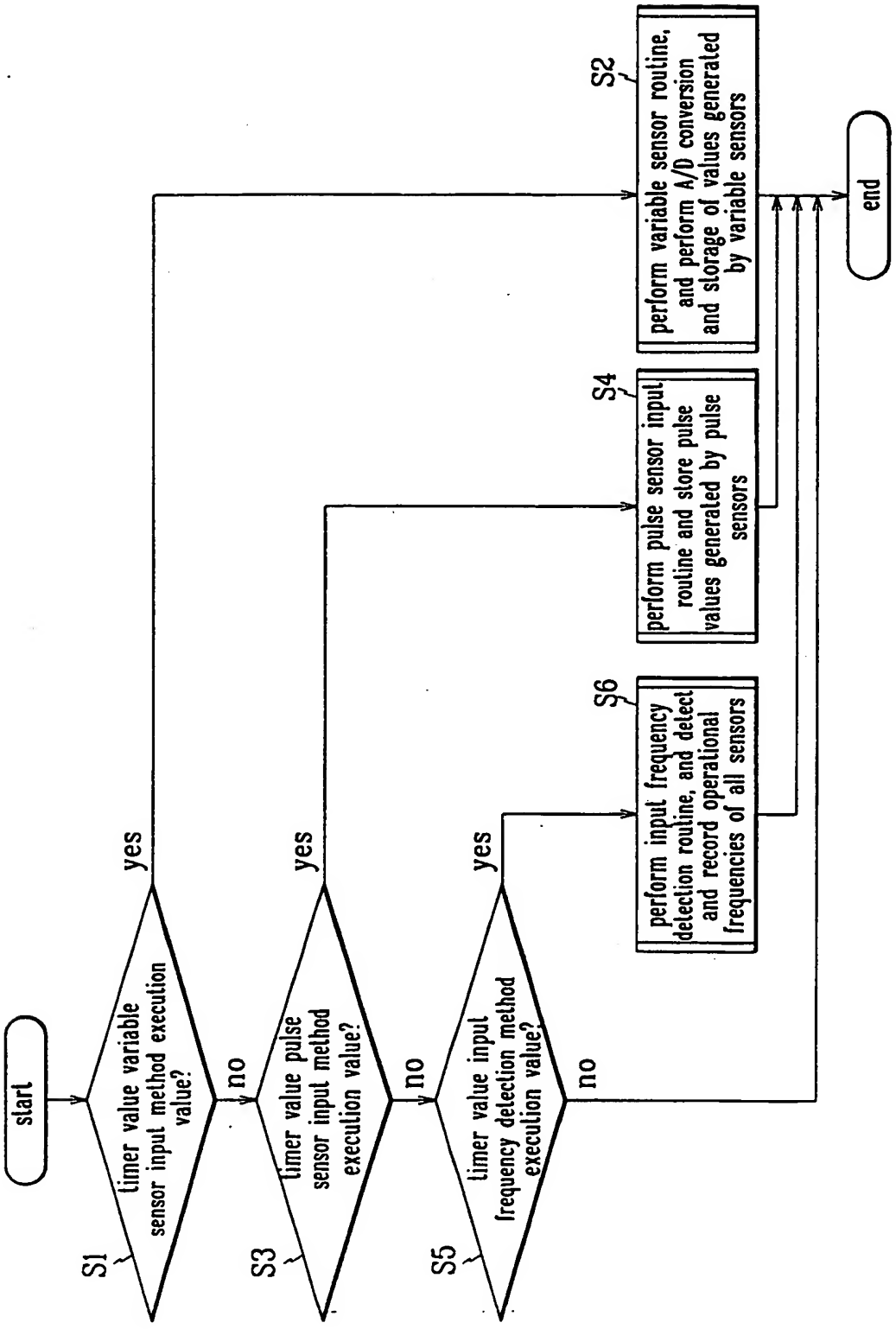

start
timer value variable sensor input method execution value?
yes
no
S1
timer value pulse sensor input method execution value?
yes
no
S3
timer value input frequency detection method execution value?
yes
no
S5
perform variable sensor routine, and perform A/D conversion and storage of values generated by variable sensors
S2
perform pulse sensor input routine and store pulse values generated by pulse sensors
S4
perform input frequency detection routine, and detect and record operational frequencies of all sensors
S6
end

FIG.5

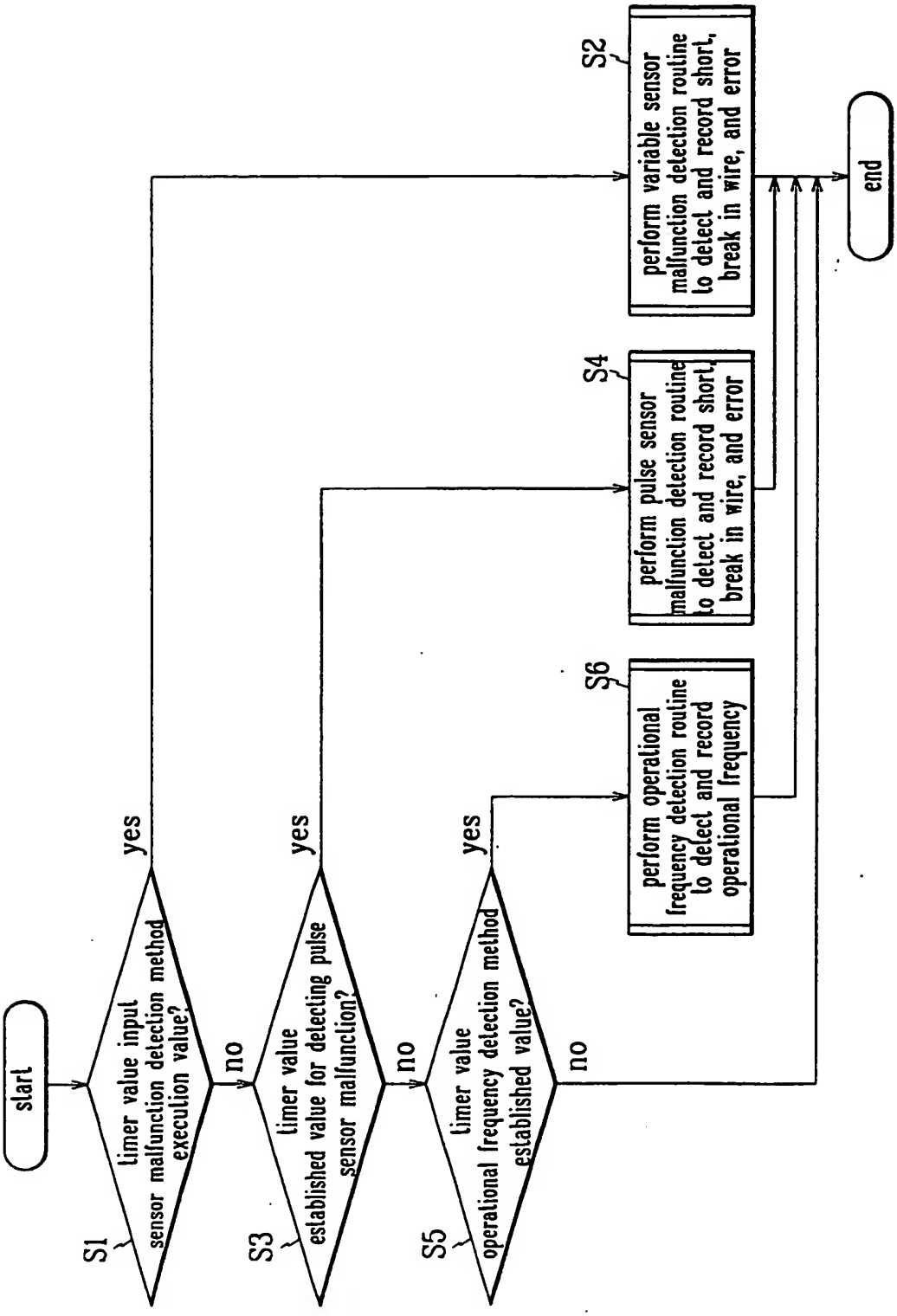

start
S1
timer value input sensor malfunction detection method execution value?
yes
no
S3
timer value established value for detecting pulse sensor malfunction?
yes
no
S5
timer value operational frequency detection method established value?
yes
no
S2
perform variable sensor malfunction detection routine to detect and record short, break in wire, and error
S4
perform pulse sensor malfunction detection routine to detect and record short, break in wire, and error
S6
perform operational frequency detection routine to detect and record operational frequency
end

FIG. 6

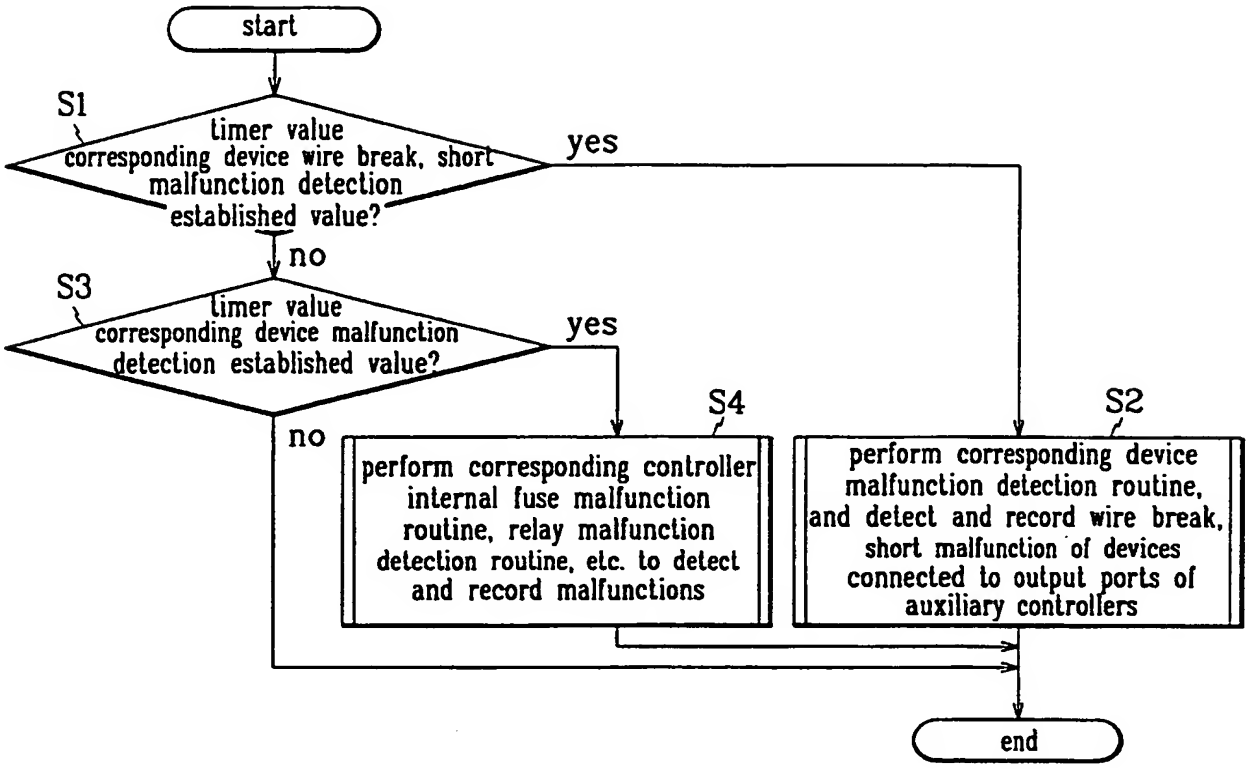

start
S1
timer value corresponding device wire break, short malfunction detection established value?
yes
no
S3
timer value corresponding device malfunction detection established value?
yes
no
S4
perform corresponding controller internal fuse malfunction routine, relay malfunction detection routine, etc. to detect and record malfunctions
S2
perform corresponding device malfunction detection routine, and detect and record wire break, short malfunction of devices connected to output ports of auxiliary controllers
end

FIG. 7

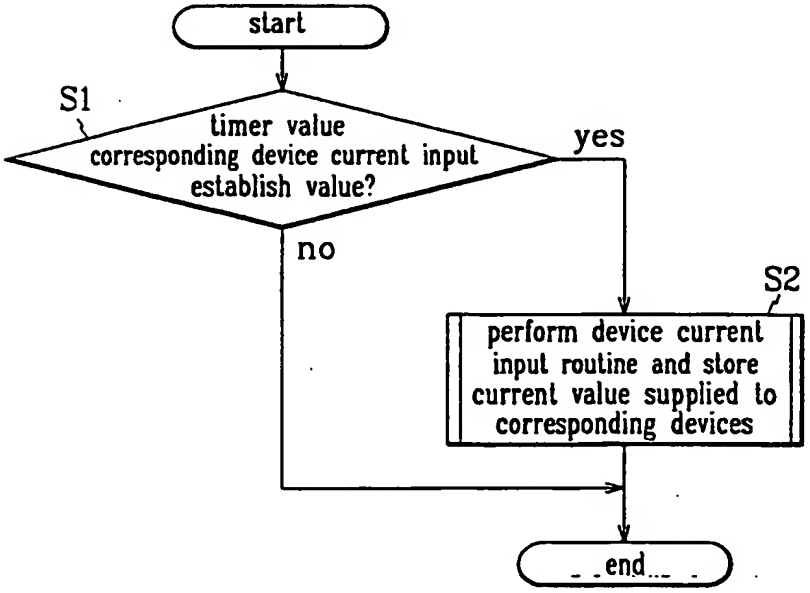

start
S1
timer value corresponding device current input establish value?
yes
no
S2
perform device current input routine and store current value supplied to corresponding devices
end

FIG.8

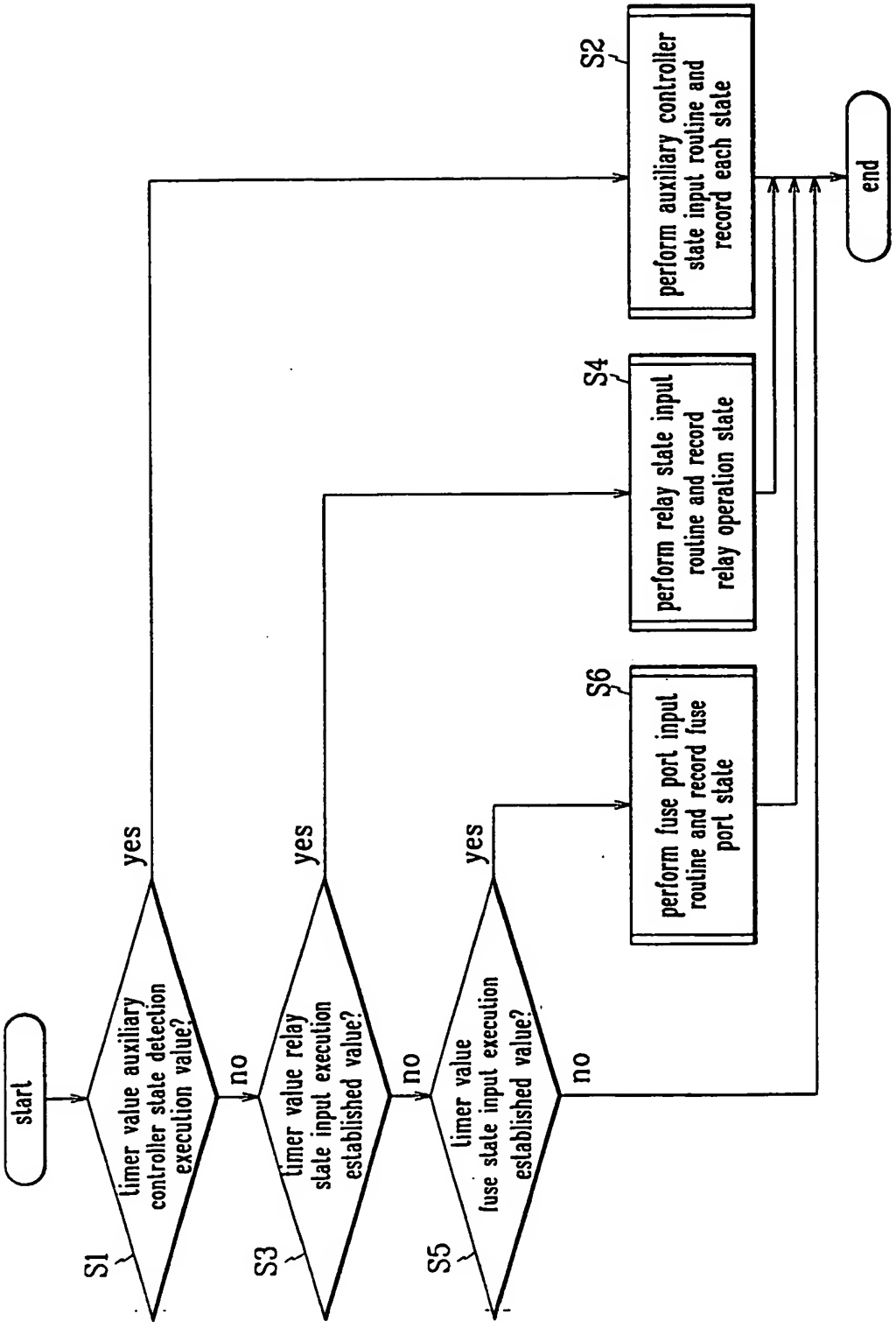

start
limer value auxiliary controller state detection execution value?
S1
yes
no
limer value relay state input execution established value?
S3
yes
no
limer value fuse state input execution established value?
S5
yes
no
perform auxiliary controller state input routine and record each state
S2
perform relay state input routine and record relay operation state
S4
perform fuse port input routine and record fuse port state
S6
end

FIG. 9

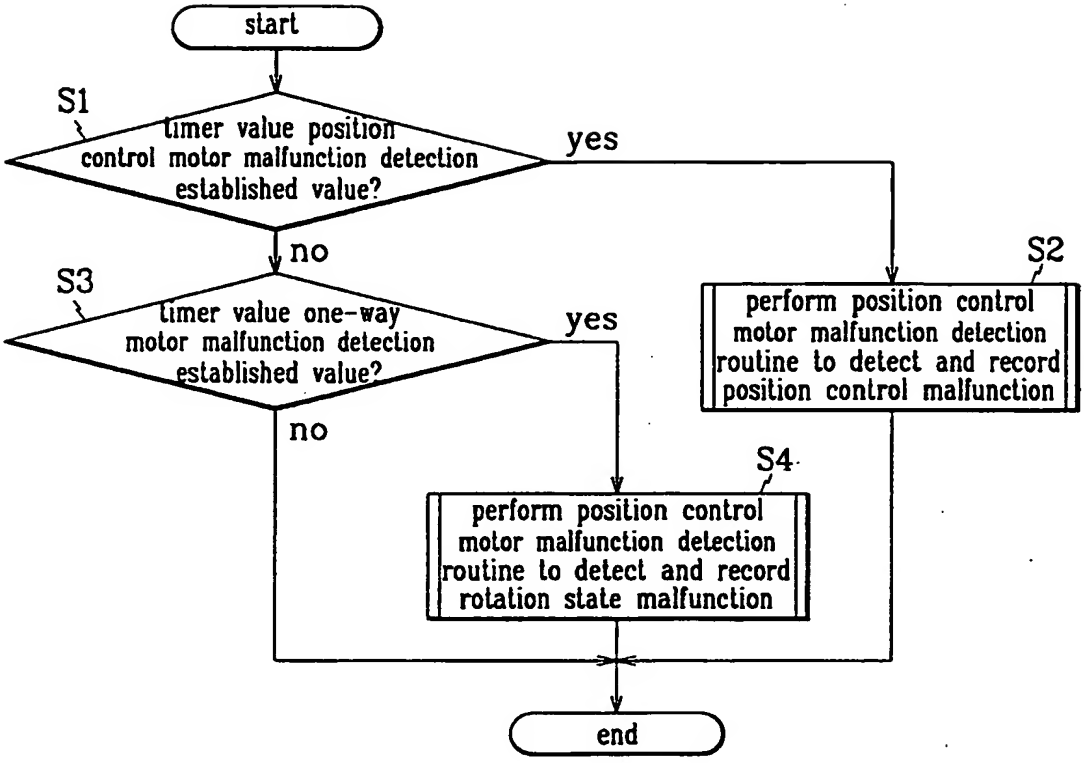

start
S1
timer value position control motor malfunction detection established value?
yes
no
S2
perform position control motor malfunction detection routine to detect and record position control malfunction
S3
timer value one-way motor malfunction detection established value?
yes
no
S4
perform position control motor malfunction detection routine to detect and record rotation state malfunction
end

FIG. 10

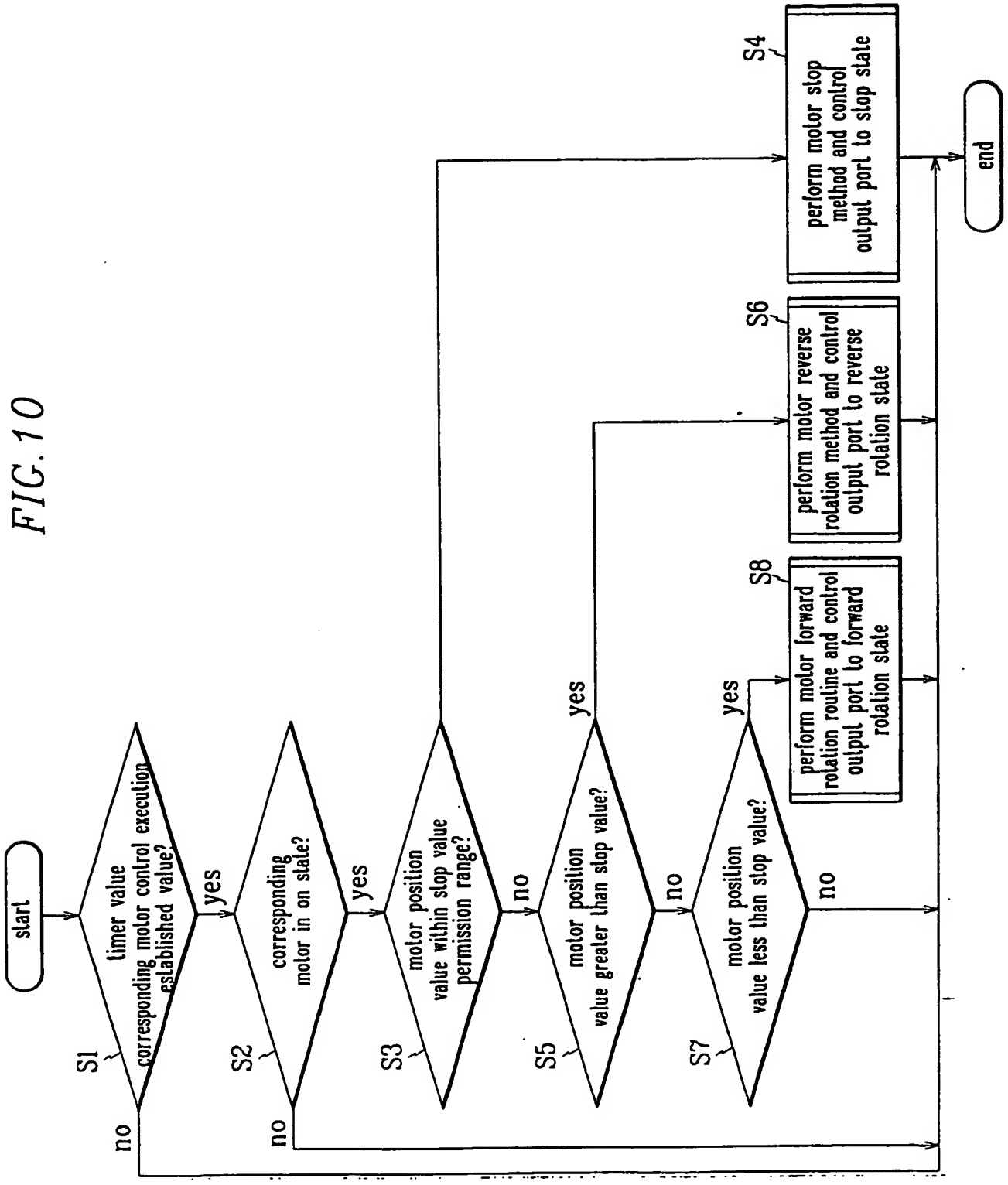

start
timer value corresponding motor control execution established value?
yes
no
S1
corresponding motor in on state?
yes
no
S2
motor position value within stop value permission range?
no
S3
motor position value greater than stop value?
yes
no
S5
motor position value less than stop value?
yes
no
S7
perform motor forward rotation routine and control output port to forward rotation state
S8
perform motor reverse rotation method and control output port to reverse rotation state
S6
perform motor stop method and control output port to stop state
S4
end

FIG. 11

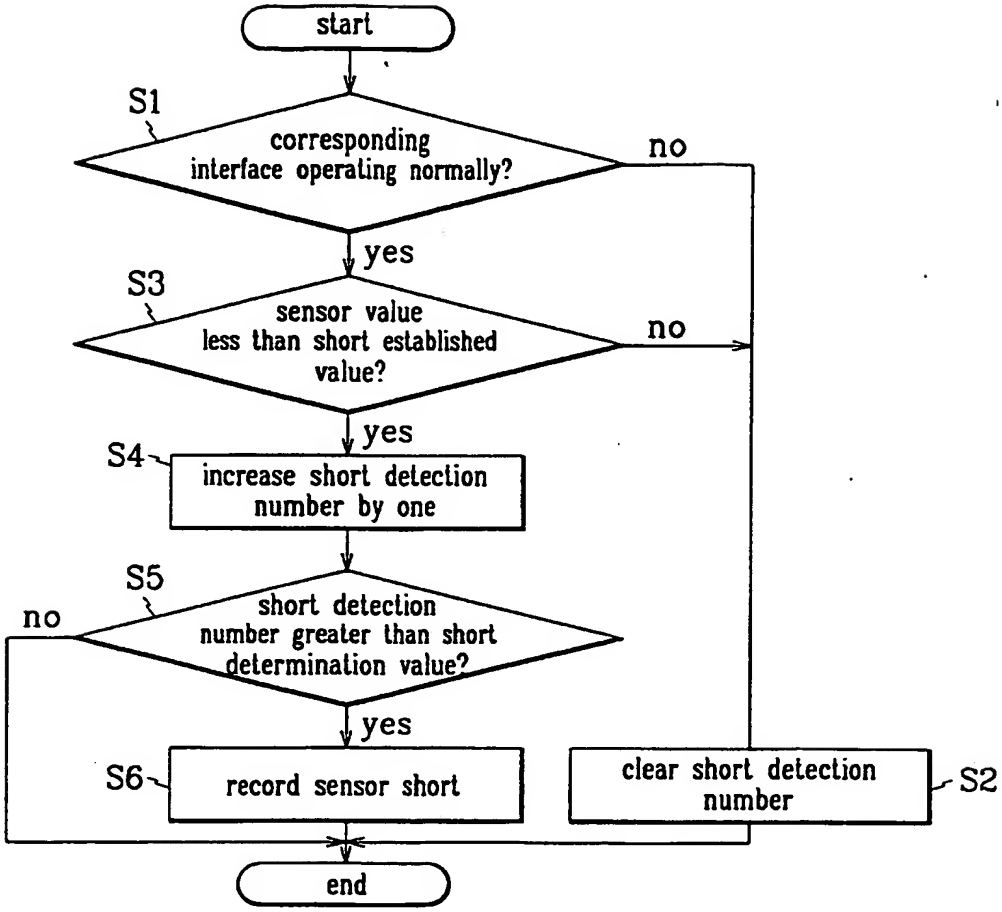

start
S1
corresponding interface operating normally?
no
yes
S3
sensor value less than short established value?
no
yes
S4
increase short detection number by one
S5
short detection number greater than short determination value?
no
yes
S6
record sensor short
clear short detection number
S2
end

FIG. 12

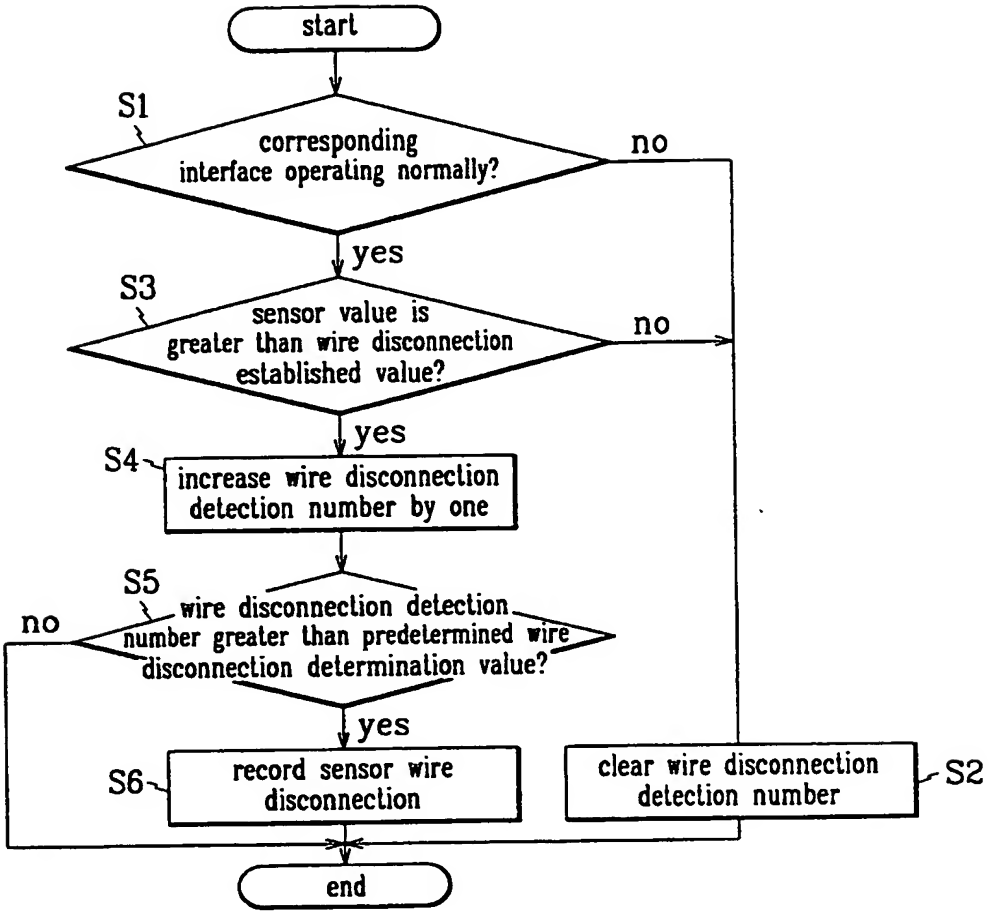

start
S1
corresponding interface operating normally?
no
yes
S3
sensor value is greater than wire disconnection established value?
no
yes
S4
increase wire disconnection detection number by one
S5
wire disconnection detection number greater than predetermined wire disconnection determination value?
no
yes
S6
record sensor wire disconnection
clear wire disconnection detection number
S2
end

FIG. 13

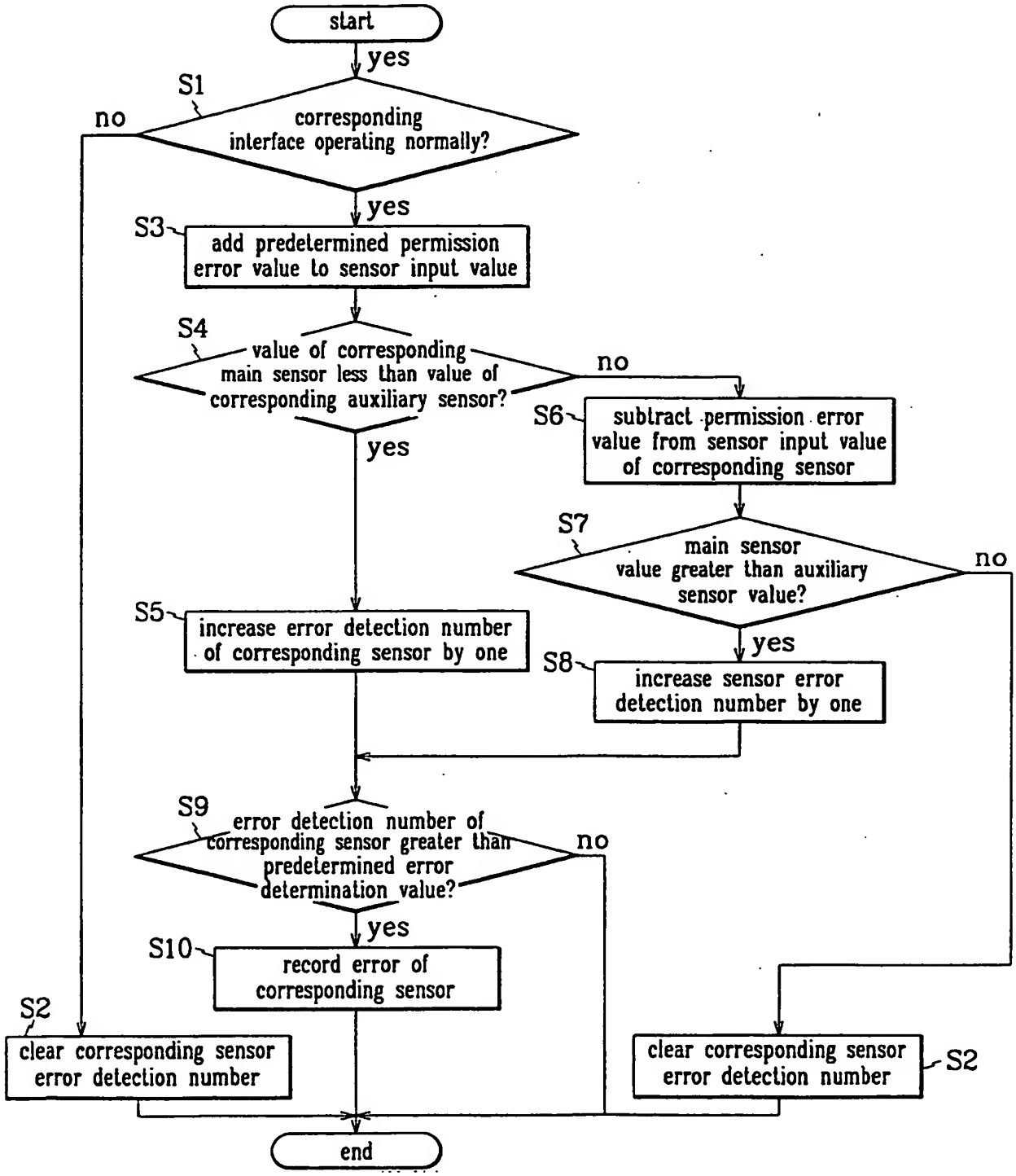

start
yes
S1
corresponding interface operating normally?
no
yes
S3
add predetermined permission error value to sensor input value
S4
value of corresponding main sensor less than value of corresponding auxiliary sensor?
no
yes
S6
subtract permission error value from sensor input value of corresponding sensor
S7
main sensor value greater than auxiliary sensor value?
no
yes
S5
increase error detection number of corresponding sensor by one
S8
increase sensor error detection number by one
S9
error detection number of corresponding sensor greater than predetermined error determination value?
no
yes
S10
record error of corresponding sensor
S2
clear corresponding sensor error detection number
S2
clear corresponding sensor error detection number
end

FIG. 14

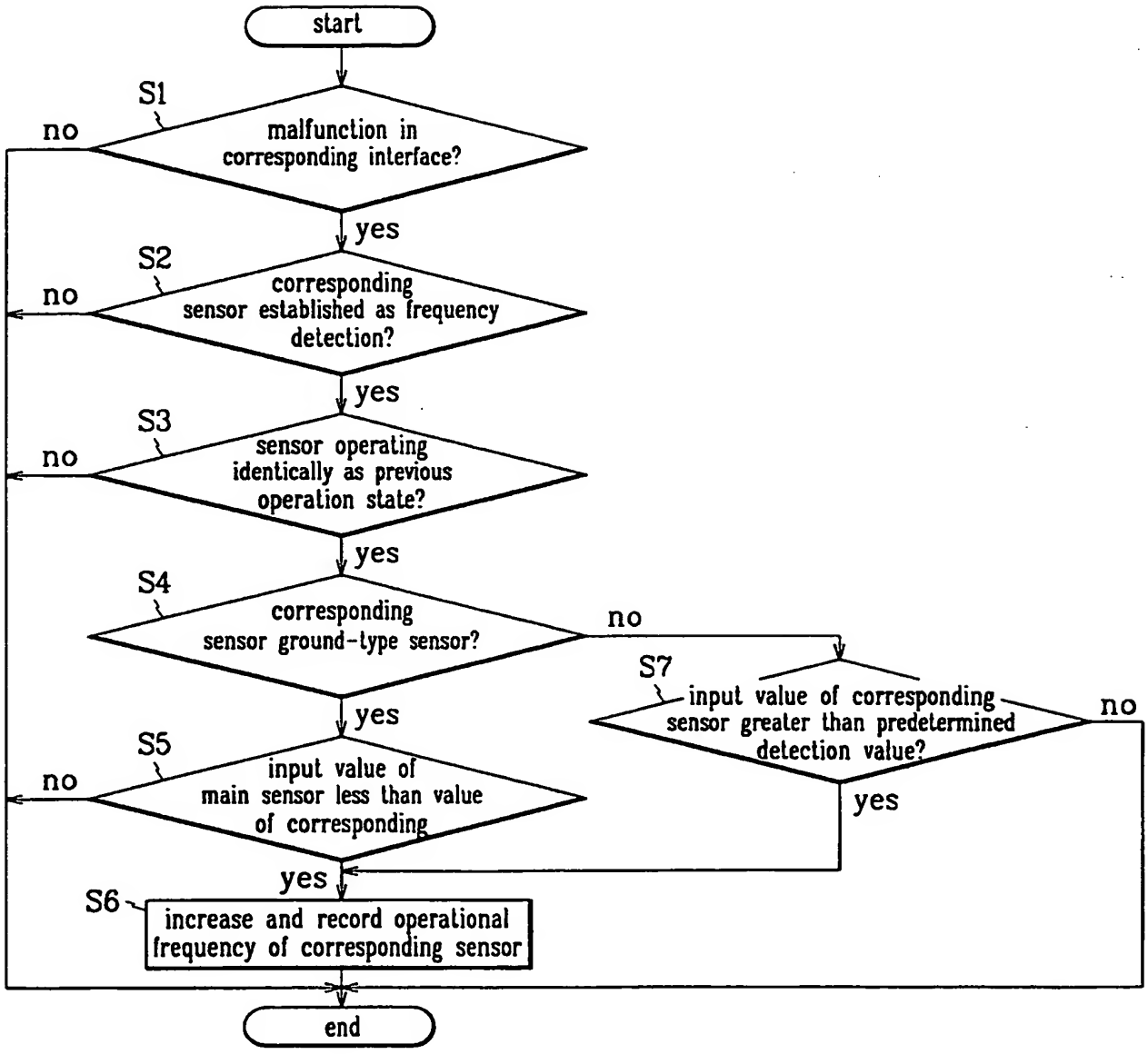

start
S1
malfunction in corresponding interface?
no
yes
S2
corresponding sensor established as frequency detection?
no
yes
S3
sensor operating identically as previous operation state?
no
yes
S4
corresponding sensor ground-type sensor?
no
yes
S7
input value of corresponding sensor greater than predetermined detection value?
no
yes
S5
input value of main sensor less than value of corresponding
no
yes
S6
increase and record operational frequency of corresponding sensor
end

FIG. 15

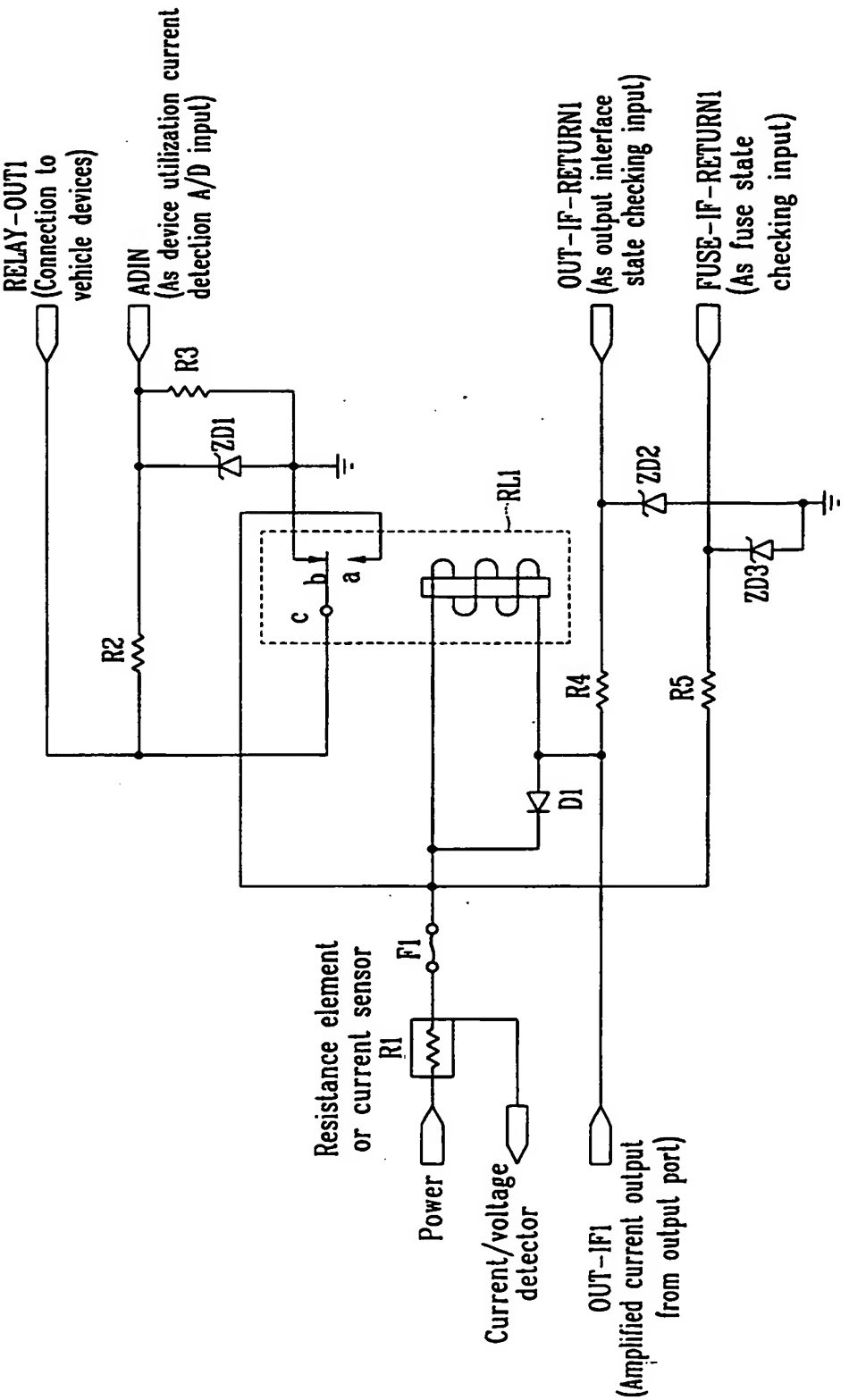

RELAY-OUT1
(Connection to
vehicle devices)
ADIN
(As device utilization current
detection A/D input)
R3
ZD1
R2
RL1
c
b
a
OUT-IF-RETURN1
(As output interface
state checking input)
FUSE-IF-RETURN1
(As fuse state
checking input)
ZD2
ZD3
R4
R5
D1
F1
Resistance element
or current sensor
R1
Power
Current/voltage
detector
OUT-IF1
(Amplified current output
from output port)

FIG. 16

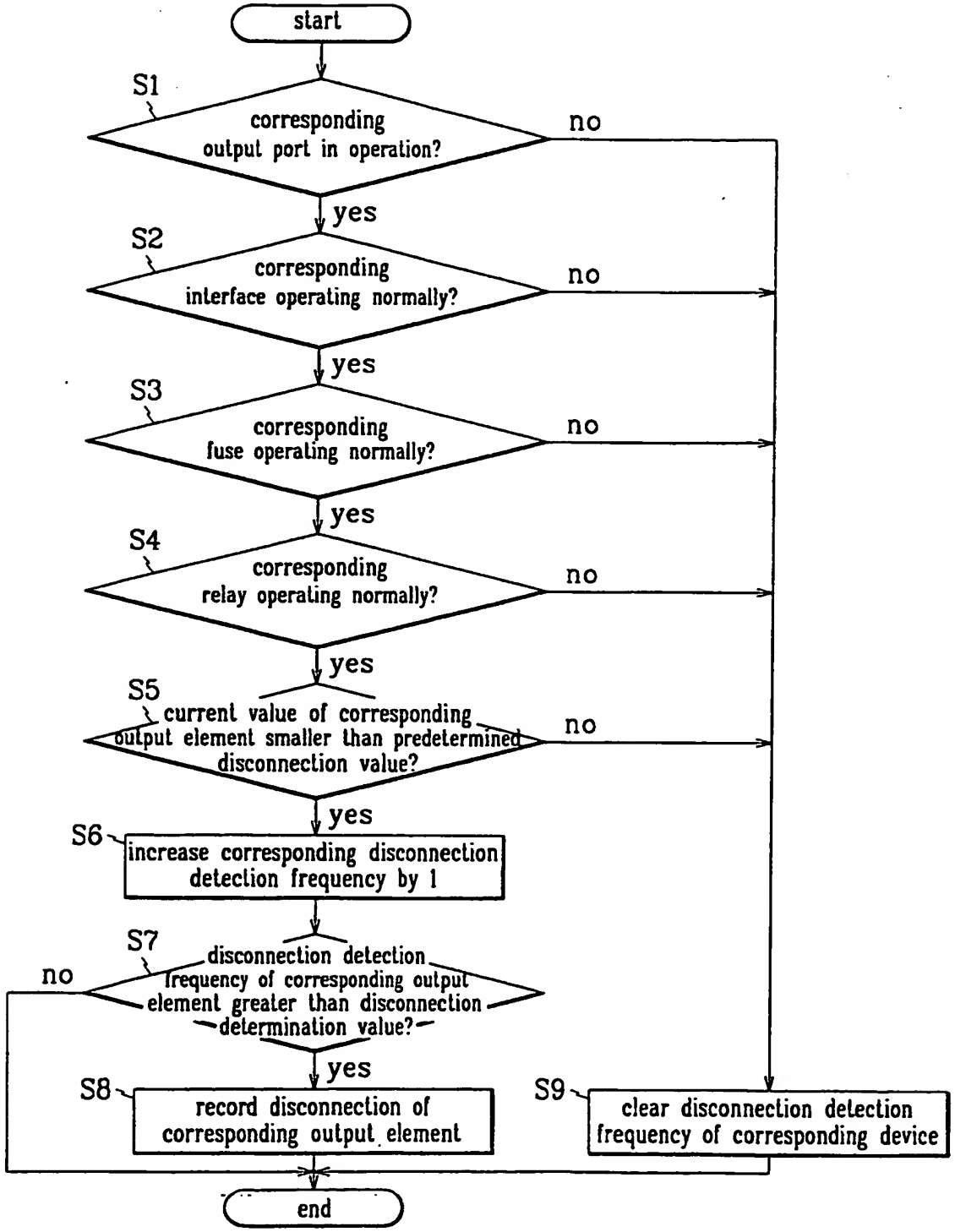

start
S1
corresponding output port in operation?
no
yes
S2
corresponding interface operating normally?
no
yes
S3
corresponding fuse operating normally?
no
yes
S4
corresponding relay operating normally?
no
yes
S5
current value of corresponding output element smaller than predetermined disconnection value?
no
yes
S6
increase corresponding disconnection detection frequency by 1
S7
disconnection detection frequency of corresponding output element greater than disconnection determination value?
no
yes
S8
record disconnection of corresponding output element
S9
clear disconnection detection frequency of corresponding device
end

FIG. 17

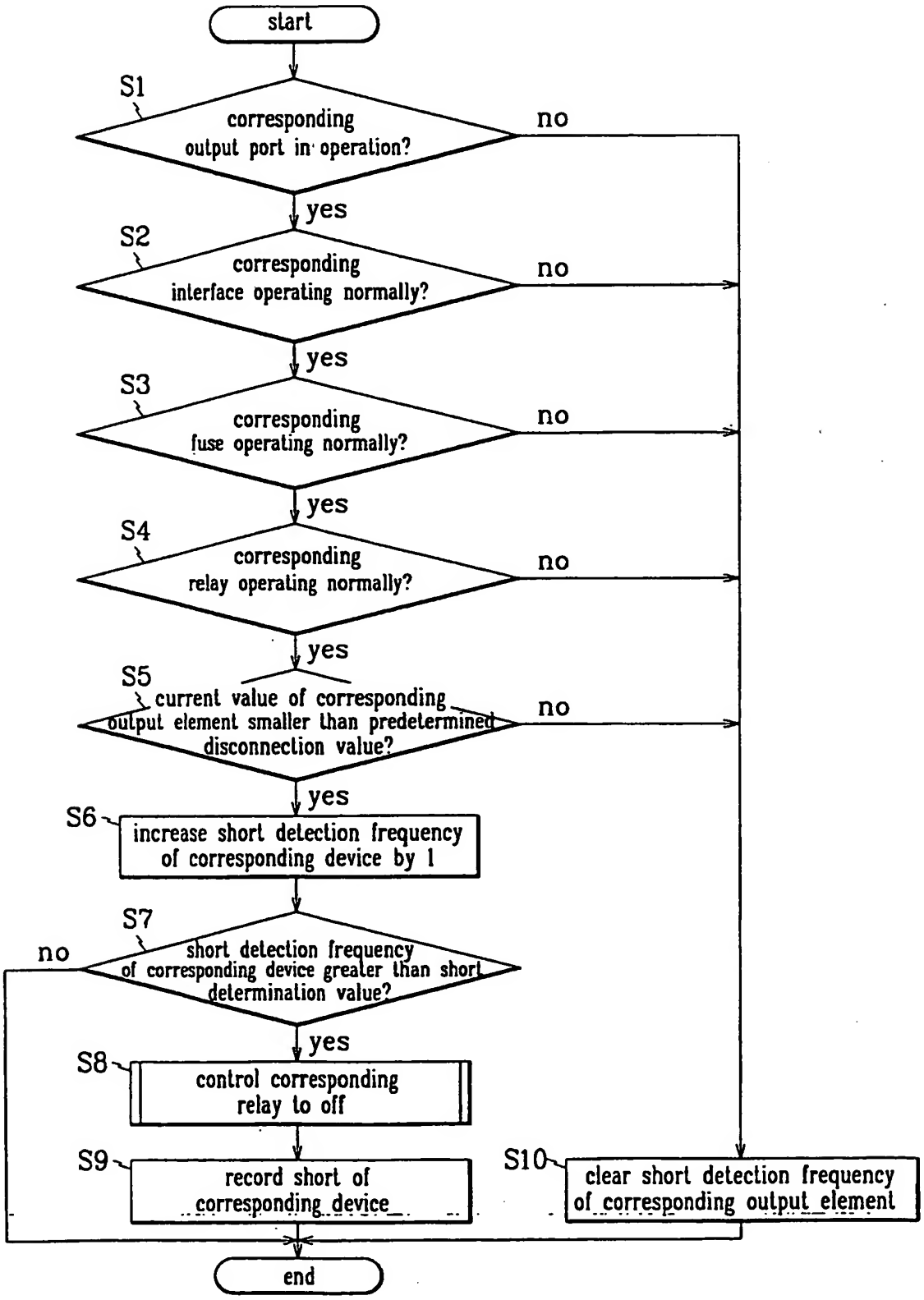

start
S1
corresponding output port in operation?
no
yes
S2
corresponding interface operating normally?
no
yes
S3
corresponding fuse operating normally?
no
yes
S4
corresponding relay operating normally?
no
yes
S5
current value of corresponding output element smaller than predetermined disconnection value?
no
yes
S6
increase short detection frequency of corresponding device by 1
S7
short detection frequency of corresponding device greater than short determination value?
no
yes
S8
control corresponding relay to off
S9
record short of corresponding device
S10
clear short detection frequency of corresponding output element
end

FIG. 18

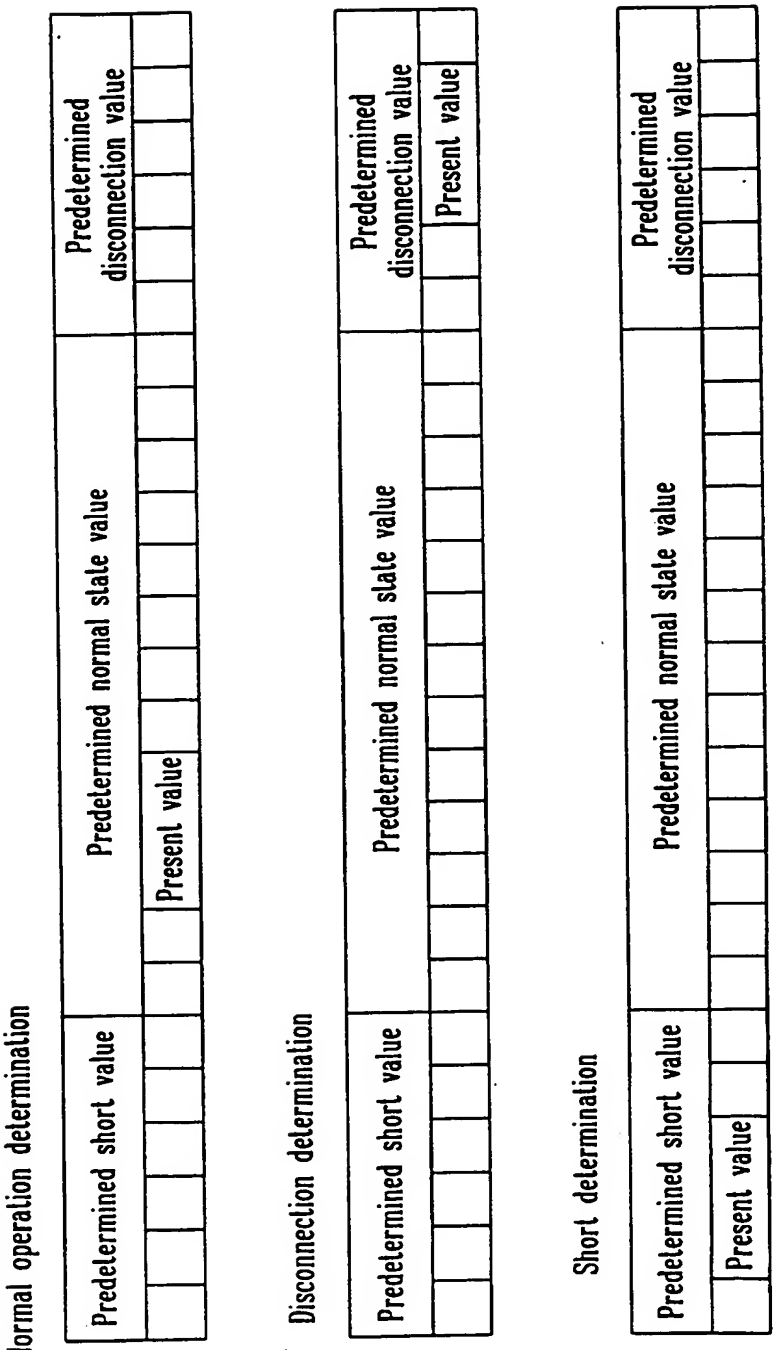

Normal operation determination
Predetermined short value
Predetermined normal state value
Present value
Predetermined disconnection value
Disconnection determination
Predetermined short value
Predetermined normal state value
Predetermined disconnection value
Present value
Short determination
Predetermined short value
Predetermined normal state value
Present value
Predetermined disconnection value

FIG. 19

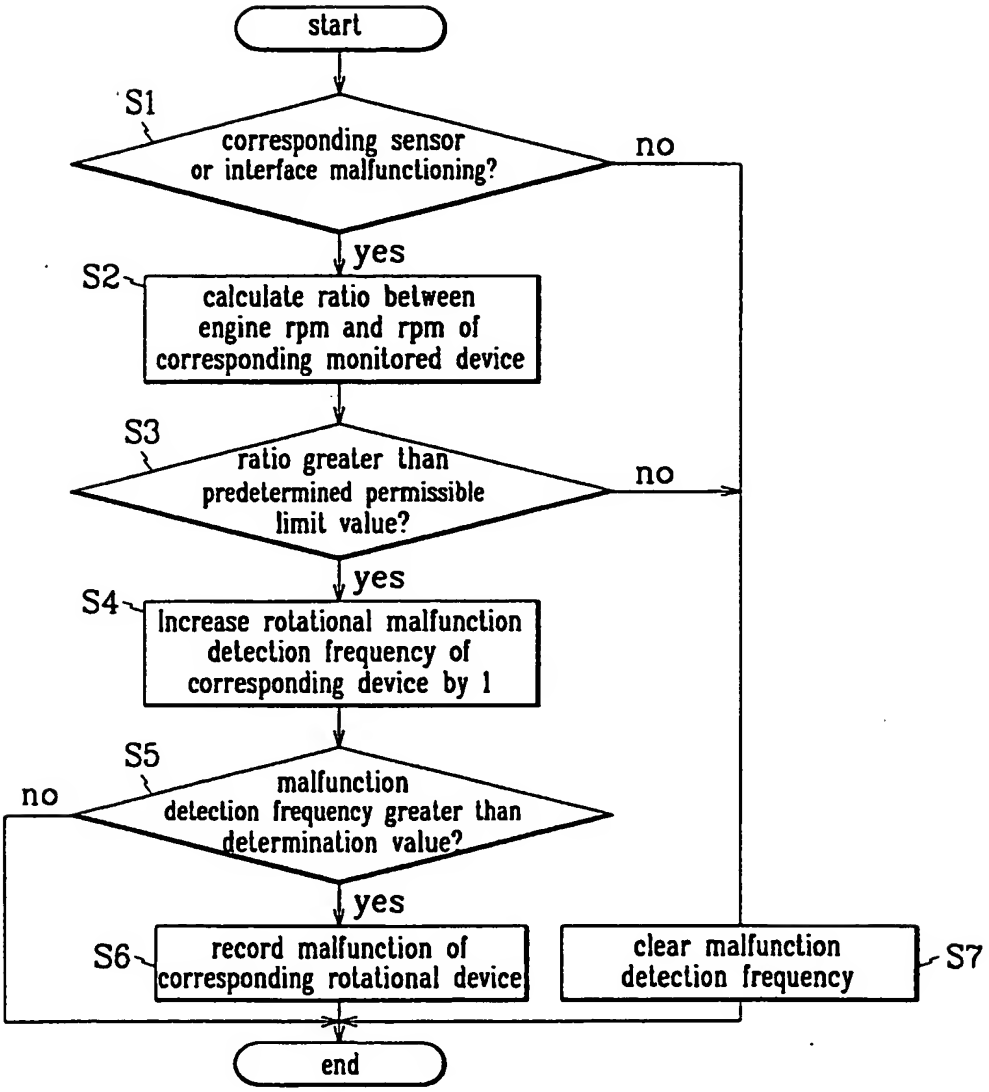

start
S1
corresponding sensor or interface malfunctioning?
no
yes
S2
calculate ratio between engine rpm and rpm of corresponding monitored device
S3
ratio greater than predetermined permissible limit value?
no
yes
S4
Increase rotational malfunction detection frequency of corresponding device by 1
S5
malfunction detection frequency greater than determination value?
no
yes
S6
record malfunction of corresponding rotational device
clear malfunction detection frequency
S7
end

FIG.20

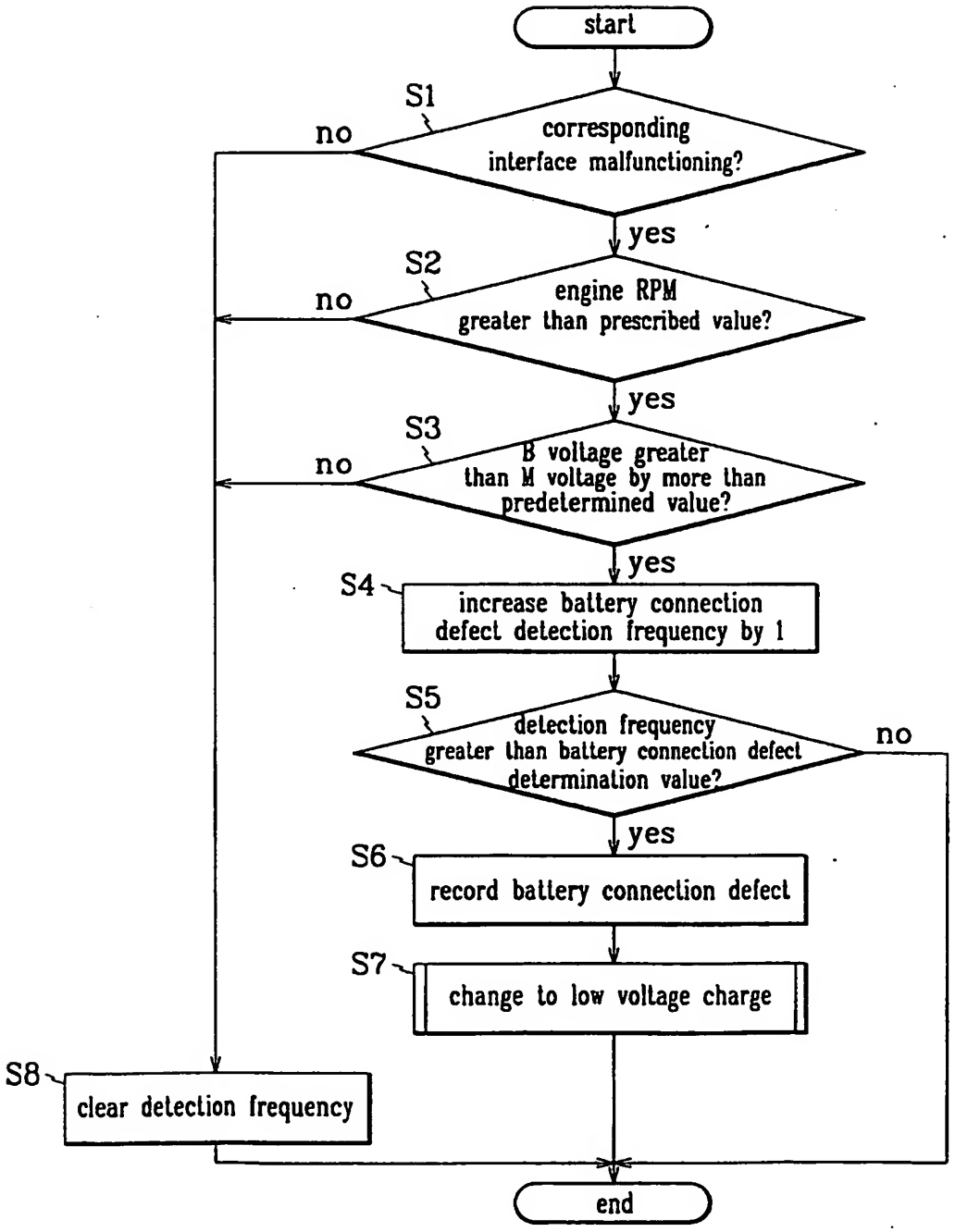

start
S1
corresponding interface malfunctioning?
no
yes
S2
engine RPM greater than prescribed value?
no
yes
S3
B voltage greater than M voltage by more than predetermined value?
no
yes
S4
increase battery connection defect detection frequency by 1
S5
detection frequency greater than battery connection defect determination value?
no
yes
S6
record battery connection defect
S7
change to low voltage charge
S8
clear detection frequency
end

FIG. 21

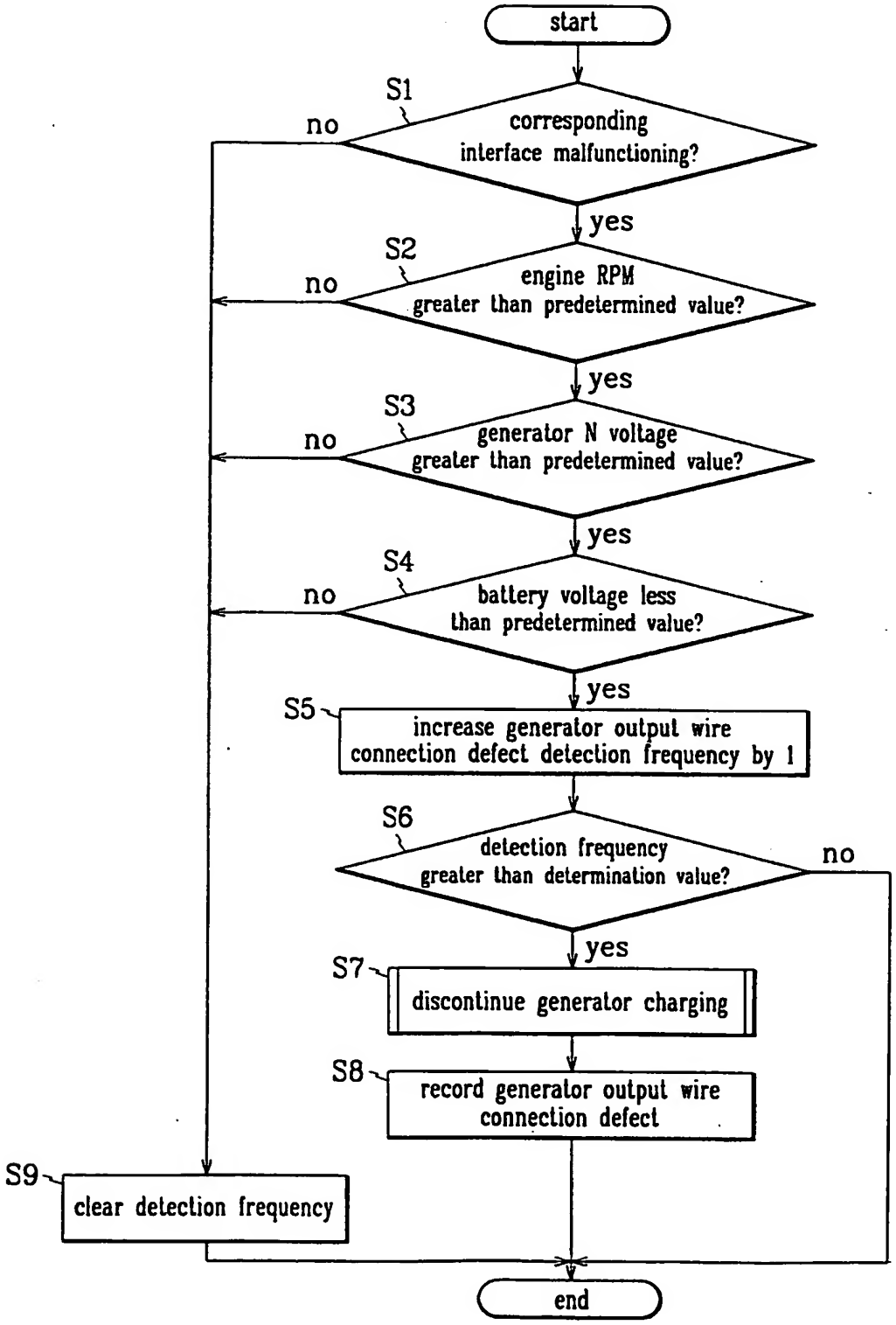

start
S1
corresponding interface malfunctioning?
no
yes
S2
engine RPM greater than predetermined value?
no
yes
S3
generator N voltage greater than predetermined value?
no
yes
S4
battery voltage less than predetermined value?
no
yes
S5
increase generator output wire connection defect detection frequency by 1
S6
detection frequency greater than determination value?
no
yes
S7
discontinue generator charging
S8
record generator output wire connection defect
S9
clear detection frequency
end

FIG. 22

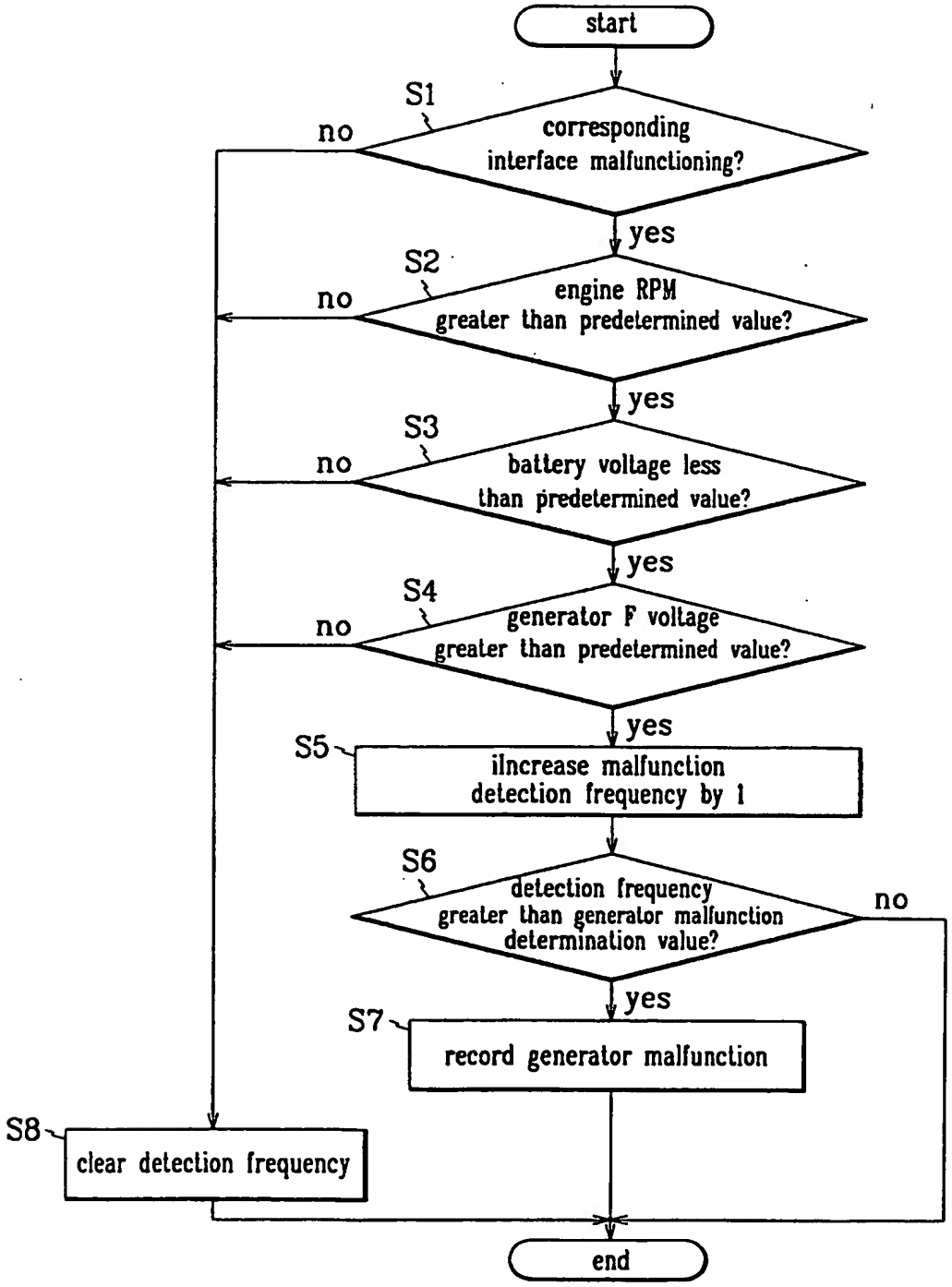

start
S1
corresponding interface malfunctioning?
no
yes
S2
engine RPM greater than predetermined value?
no
yes
S3
battery voltage less than predetermined value?
no
yes
S4
generator F voltage greater than predetermined value?
no
yes
S5
ilncrease malfunction detection frequency by 1
S6
detection frequency greater than generator malfunction determination value?
no
yes
S7
record generator malfunction
S8
clear detection frequency
end

FIG.23

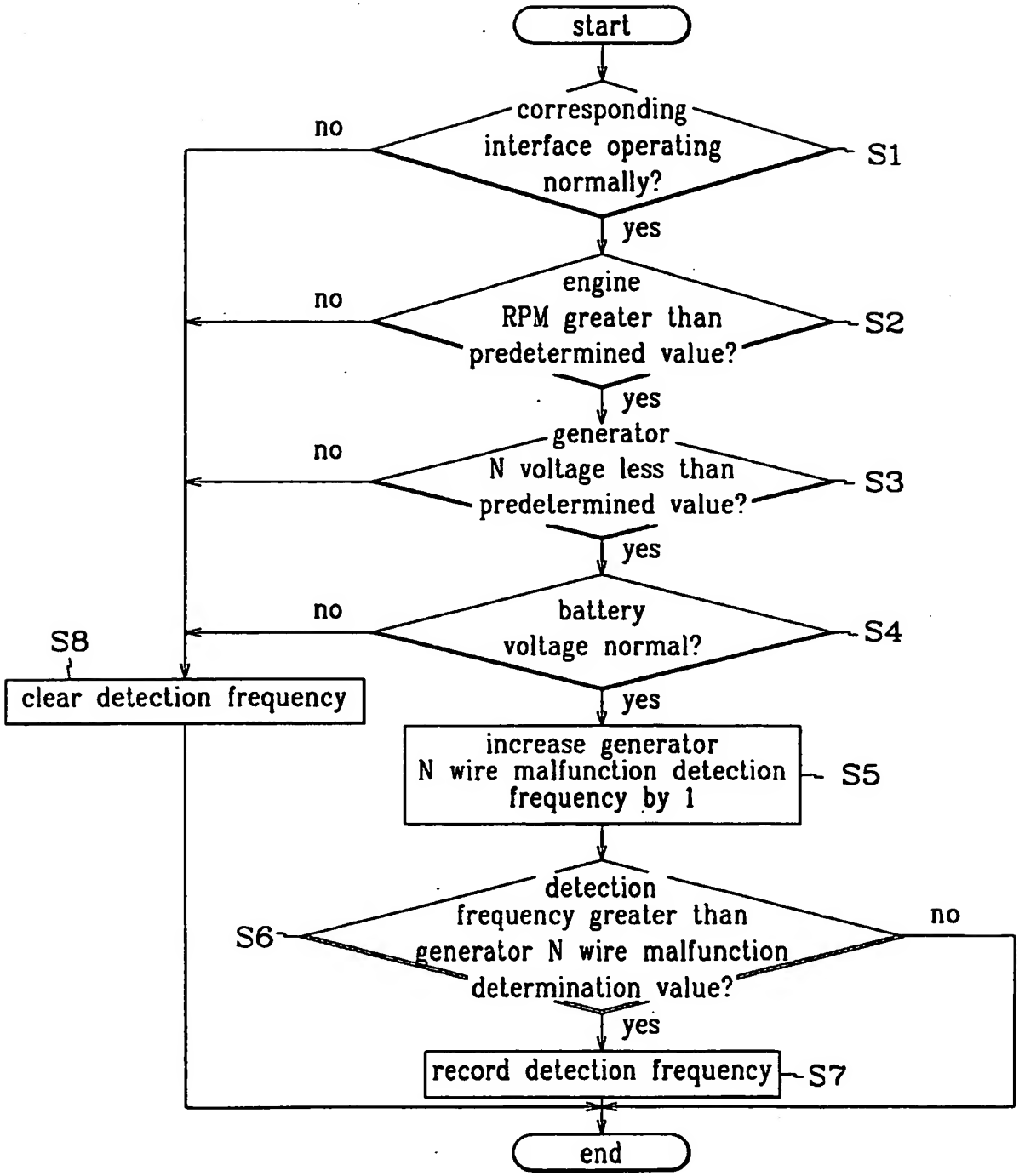

start
corresponding interface operating normally?
S1
no
yes
engine RPM greater than predetermined value?
S2
no
yes
generator N voltage less than predetermined value?
S3
no
yes
battery voltage normal?
S4
no
yes
S8
clear detection frequency
increase generator N wire malfunction detection frequency by 1
S5
detection frequency greater than generator N wire malfunction determination value?
S6
no
yes
record detection frequency
S7
end

FIG.24

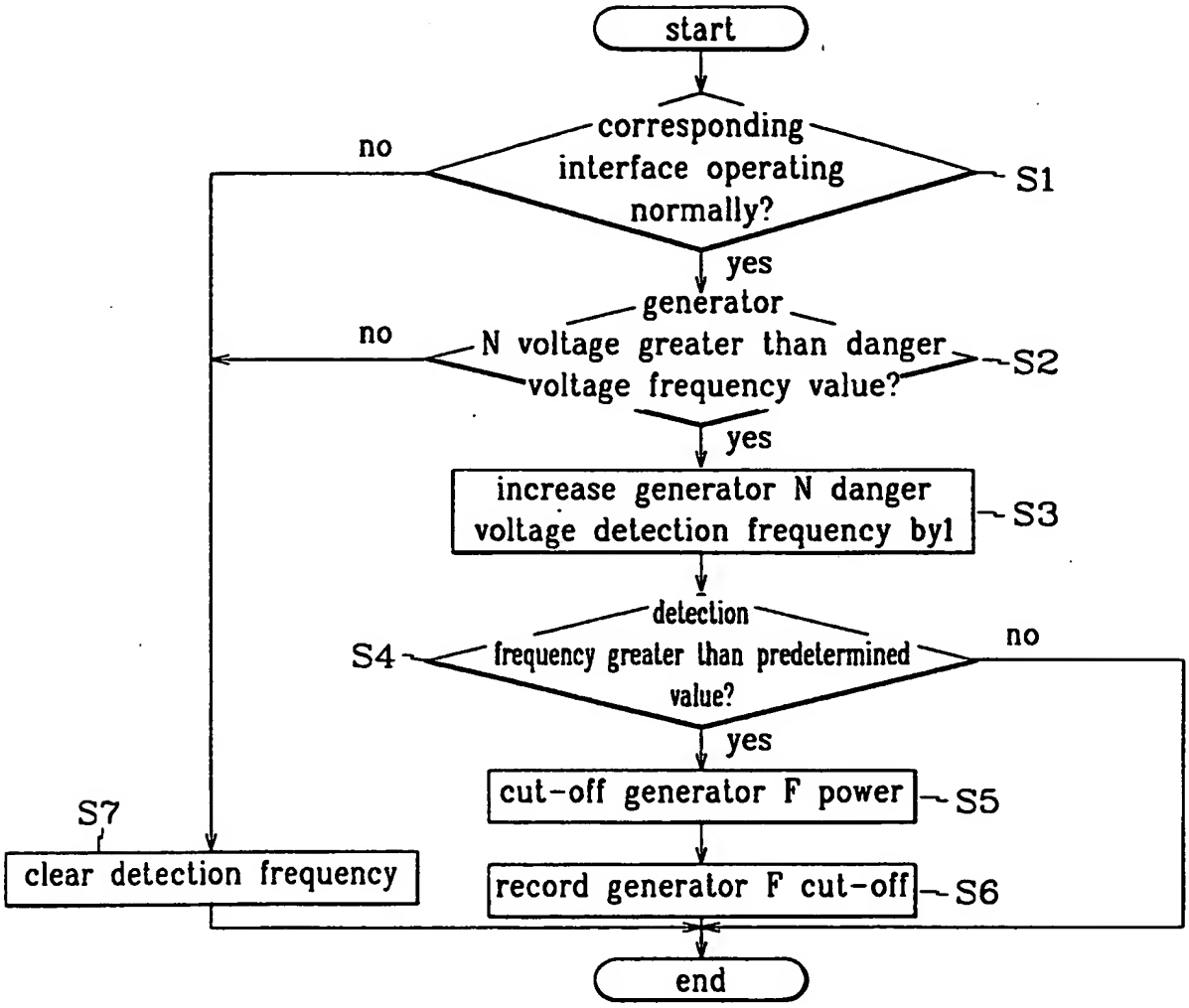

start
corresponding interface operating normally?
S1
no
yes
generator N voltage greater than danger voltage frequency value?
S2
no
yes
increase generator N danger voltage detection frequency by1
S3
detection frequency greater than predetermined value?
S4
no
yes
cut-off generator F power
S5
record generator F cut-off
S6
S7
clear detection frequency
end

FIG. 25

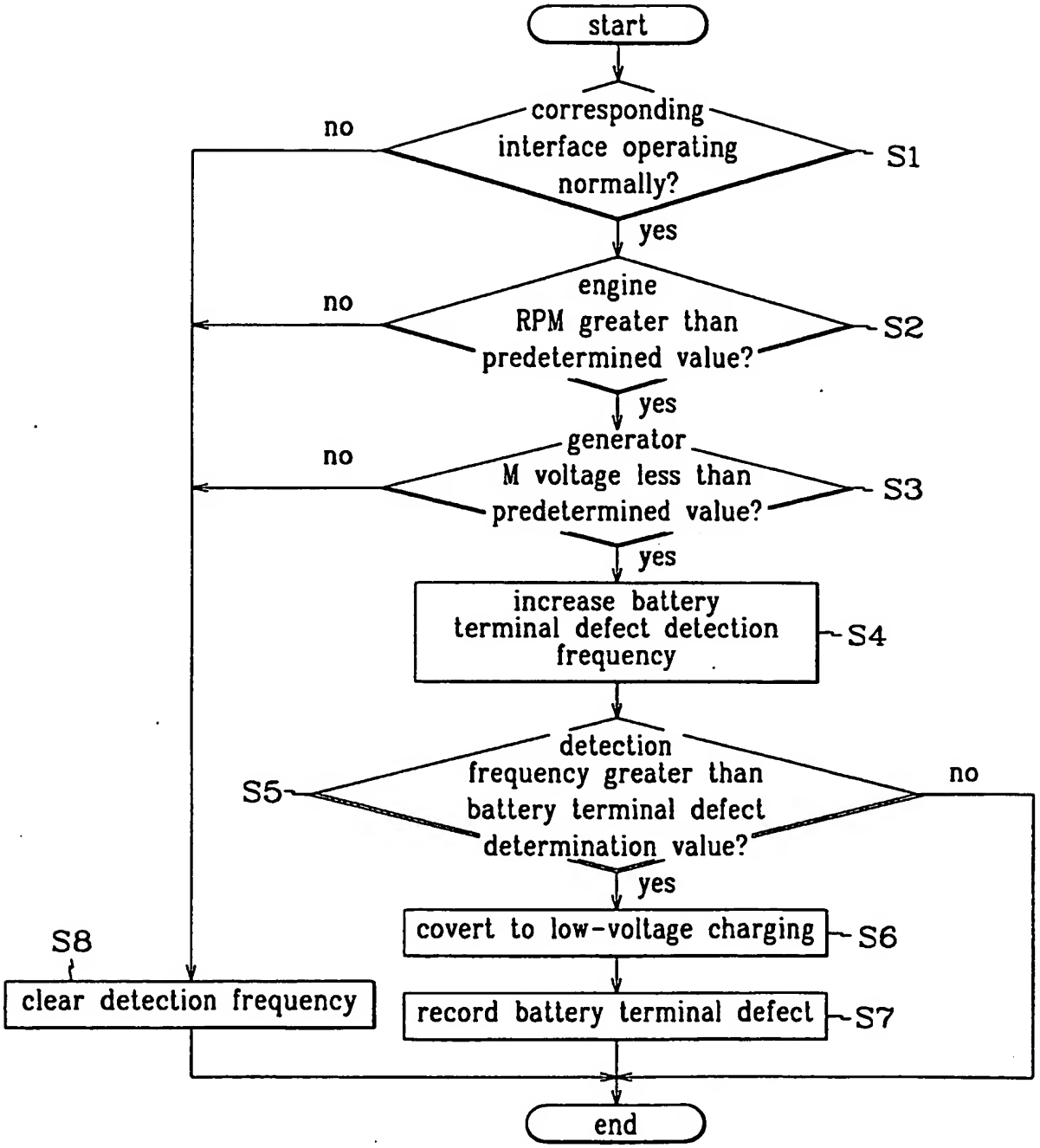

start
corresponding interface operating normally?
S1
no
yes
engine RPM greater than predetermined value?
S2
no
yes
generator M voltage less than predetermined value?
S3
no
yes
increase battery terminal defect detection frequency
S4
detection frequency greater than battery terminal defect determination value?
S5
no
yes
covert to low-voltage charging
S6
record battery terminal defect
S7
S8
clear detection frequency
end

FIG.26

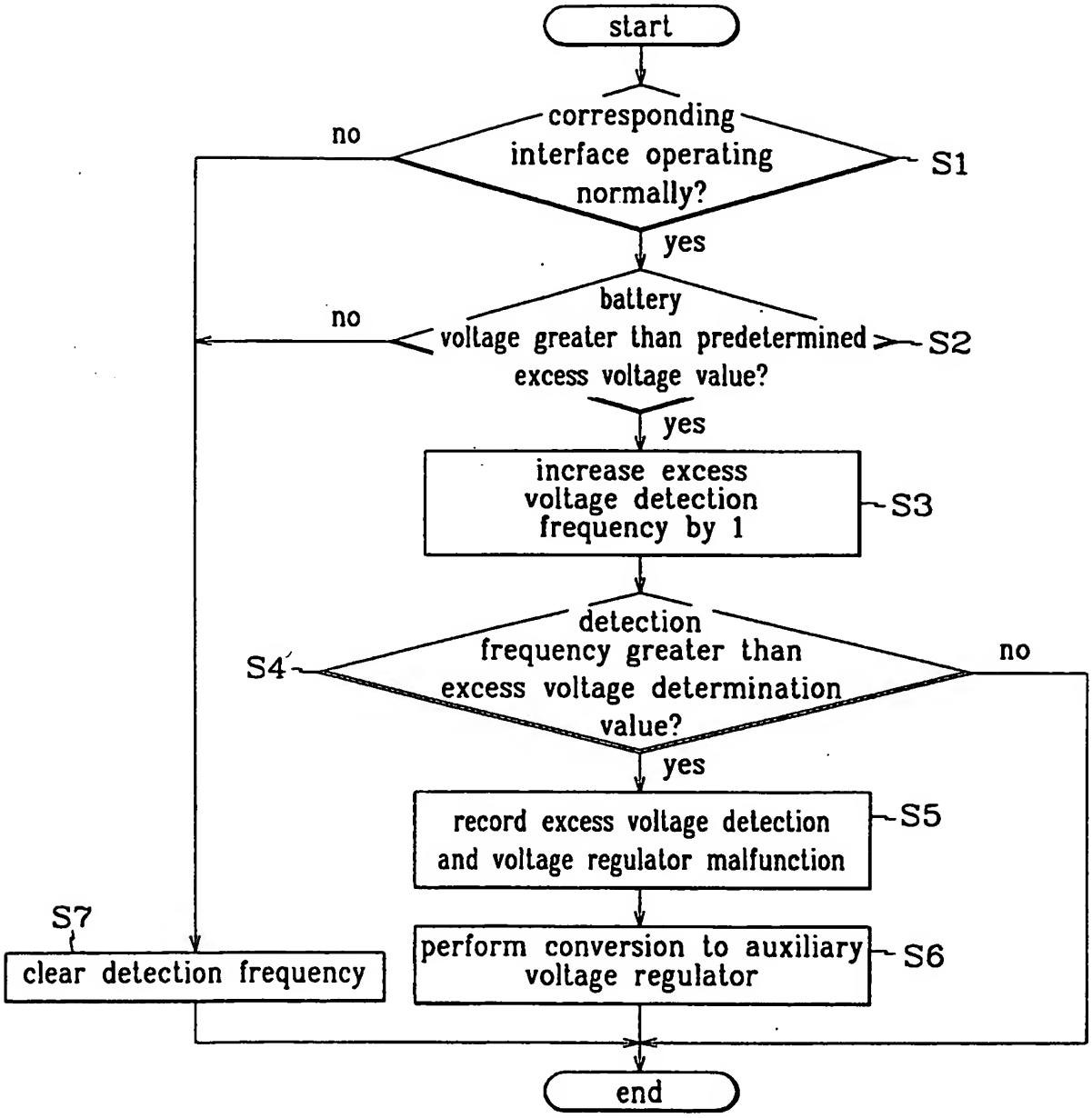

start
corresponding interface operating normally?
S1
no
yes
battery voltage greater than predetermined excess voltage value?
S2
no
yes
increase excess voltage detection frequency by 1
S3
detection frequency greater than excess voltage determination value?
S4
no
yes
record excess voltage detection and voltage regulator malfunction
S5
perform conversion to auxiliary voltage regulator
S6
S7
clear detection frequency
end

FIG. 27

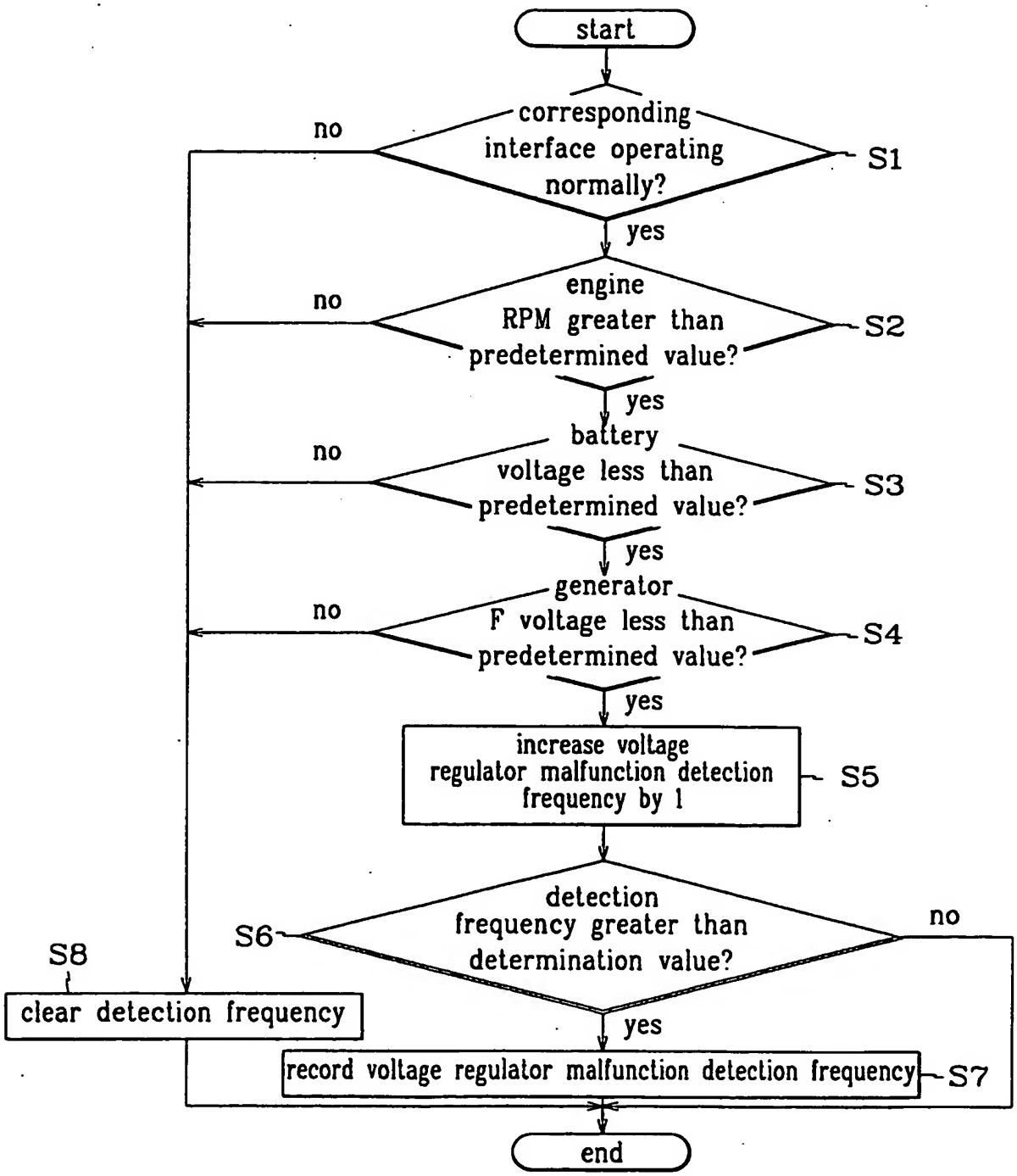

start
corresponding interface operating normally?
S1
no
yes
engine RPM greater than predetermined value?
S2
no
yes
battery voltage less than predetermined value?
S3
no
yes
generator F voltage less than predetermined value?
S4
no
yes
increase voltage regulator malfunction detection frequency by 1
S5
detection frequency greater than determination value?
S6
no
yes
record voltage regulator malfunction detection frequency
S7
S8
clear detection frequency
end

FIG.28

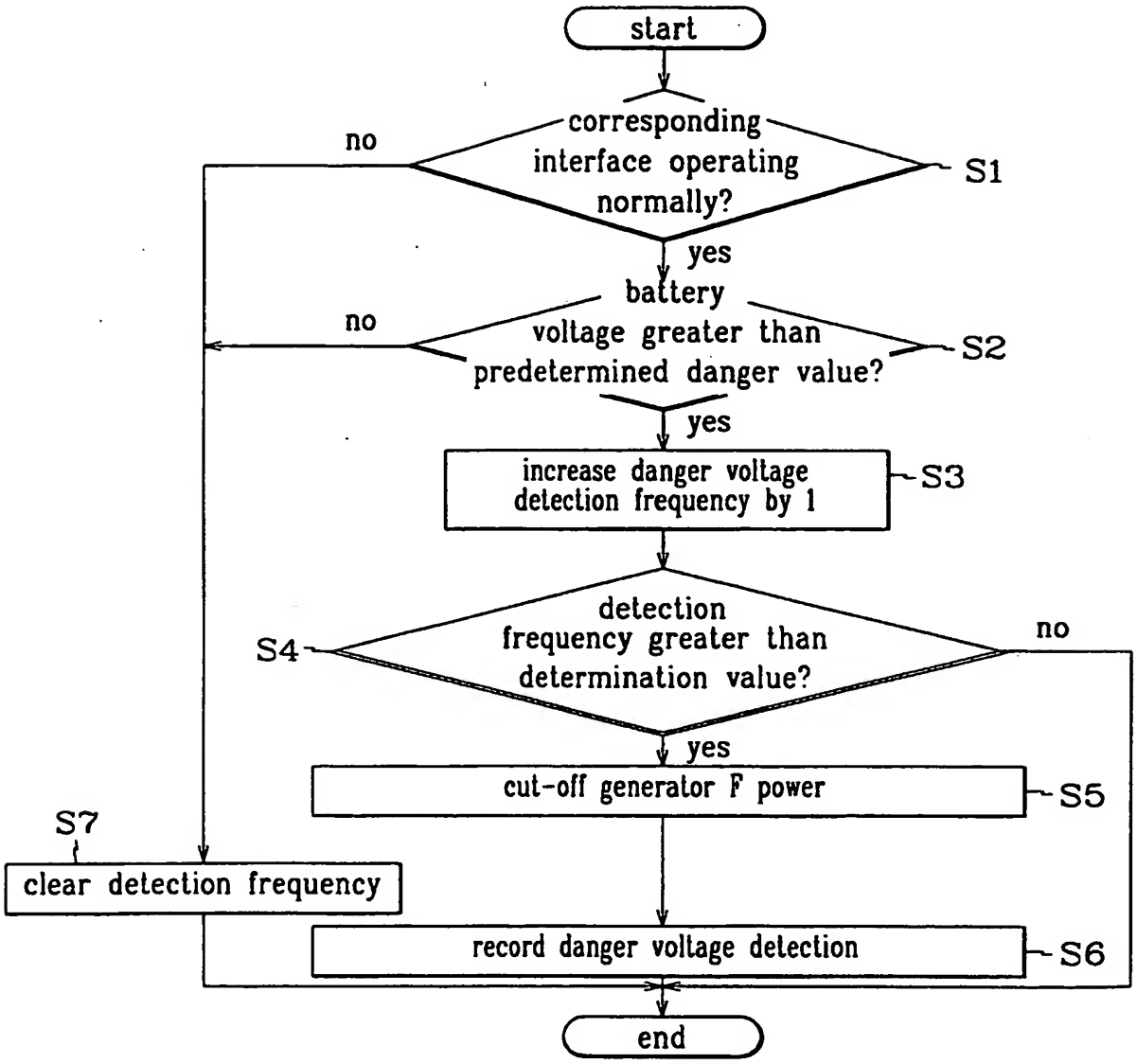

start
corresponding interface operating normally?
S1
no
yes
battery voltage greater than predetermined danger value?
S2
no
yes
increase danger voltage detection frequency by 1
S3
detection frequency greater than determination value?
S4
no
yes
cut-off generator F power
S5
record danger voltage detection
S6
S7
clear detection frequency
end

FIG.29

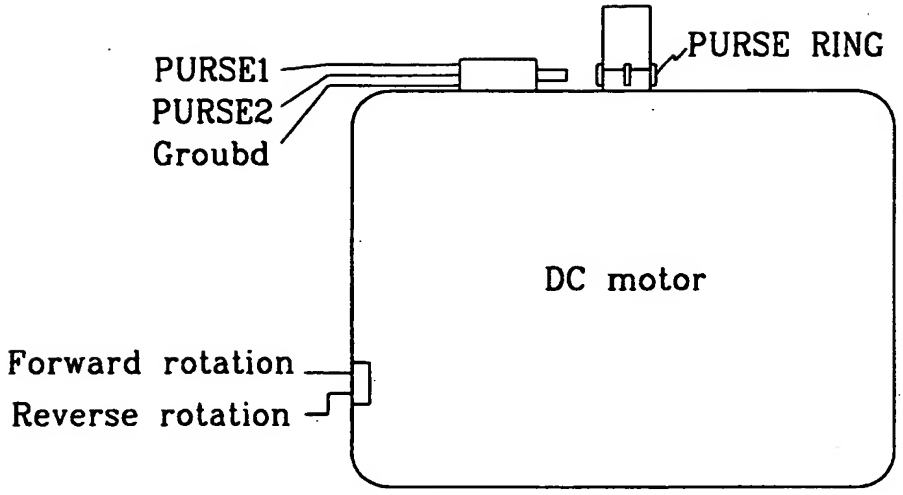

PURSE RING
PURSE1
PURSE2
Groubd
DC motor
Forward rotation
Reverse rotation

FIG. 30

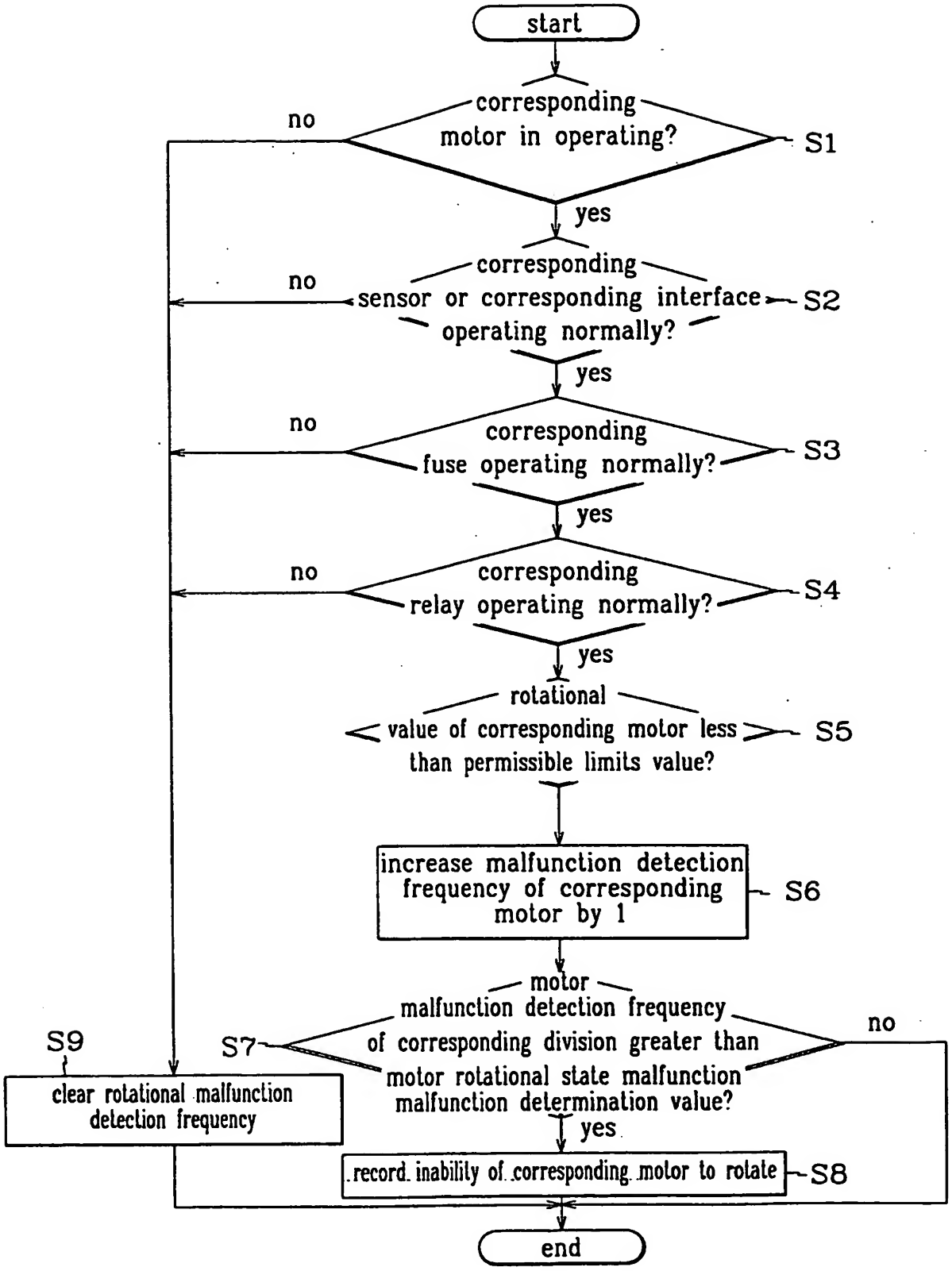

start
corresponding motor in operating?
S1
no
yes
corresponding sensor or corresponding interface operating normally?
S2
no
yes
corresponding fuse operating normally?
S3
no
yes
corresponding relay operating normally?
S4
no
yes
rotational value of corresponding motor less than permissible limits value?
S5
increase malfunction detection frequency of corresponding motor by 1
S6
motor malfunction detection frequency of corresponding division greater than motor rotational state malfunction malfunction determination value?
S7
no
yes
record inability of corresponding motor to rotate
S8
clear rotational malfunction detection frequency
S9
end

FIG. 31

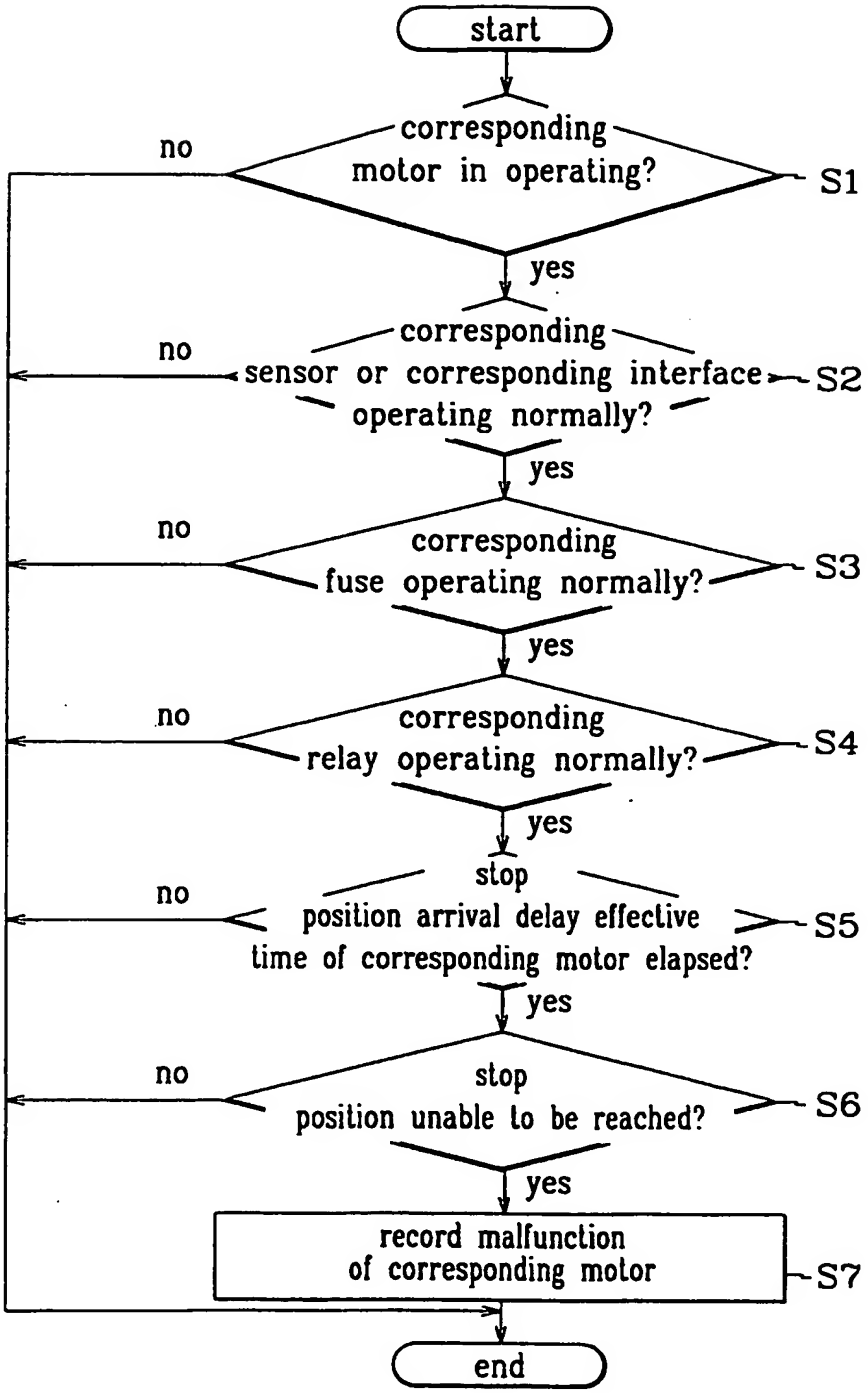

start
corresponding motor in operating?
S1
no
yes
corresponding sensor or corresponding interface operating normally?
S2
no
yes
corresponding fuse operating normally?
S3
no
yes
corresponding relay operating normally?
S4
no
yes
stop position arrival delay effective time of corresponding motor elapsed?
S5
no
yes
stop position unable to be reached?
S6
no
yes
record malfunction of corresponding motor
S7
end

FIG. 32

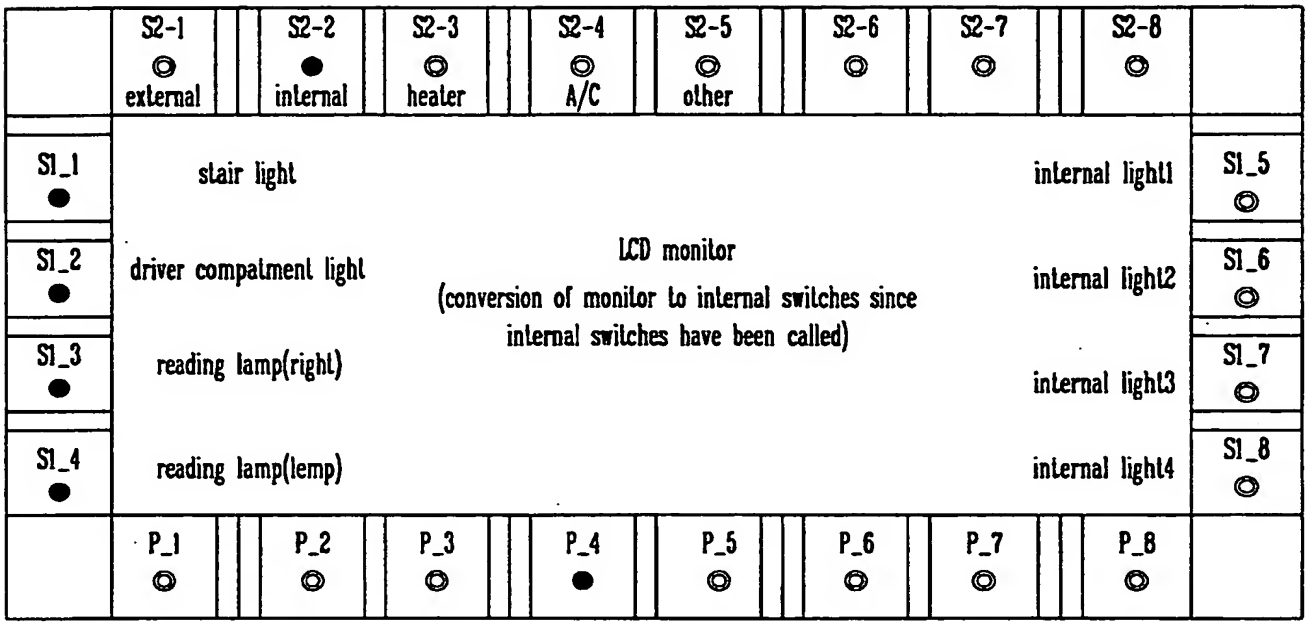

S2-1
external
S2-2
internal
S2-3
heater
S2-4
A/C
S2-5
other
S2-6
S2-7
S2-8
S1_1
S1_2
S1_3
S1_4
stair light
driver compaltment light
reading lamp(right)
reading lamp(lemp)
LCD monitor
(conversion of monitor to internal switches since internal switches have been called)
internal light1
internal light2
internal light3
internal light4
S1_5
S1_6
S1_7
S1_8
P_1
P_2
P_3
P_4
P_5
P_6
P_7
P_8

FIG. 33

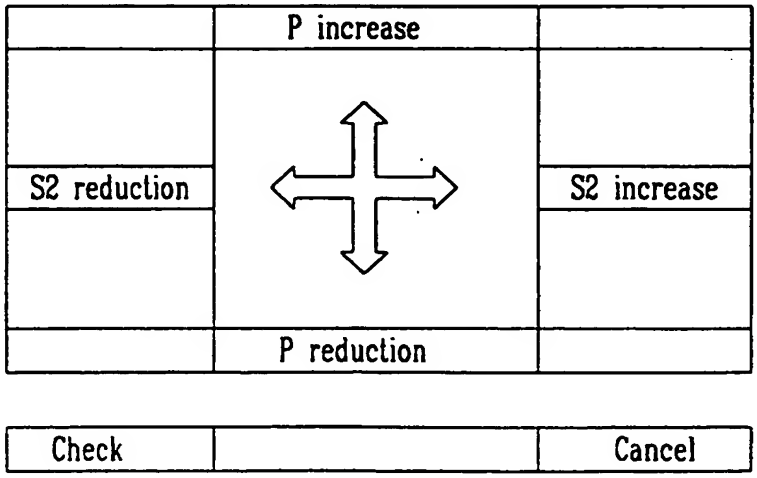

P increase
S2 reduction
S2 increase
P reduction
Check
Cancel

FIG. 34

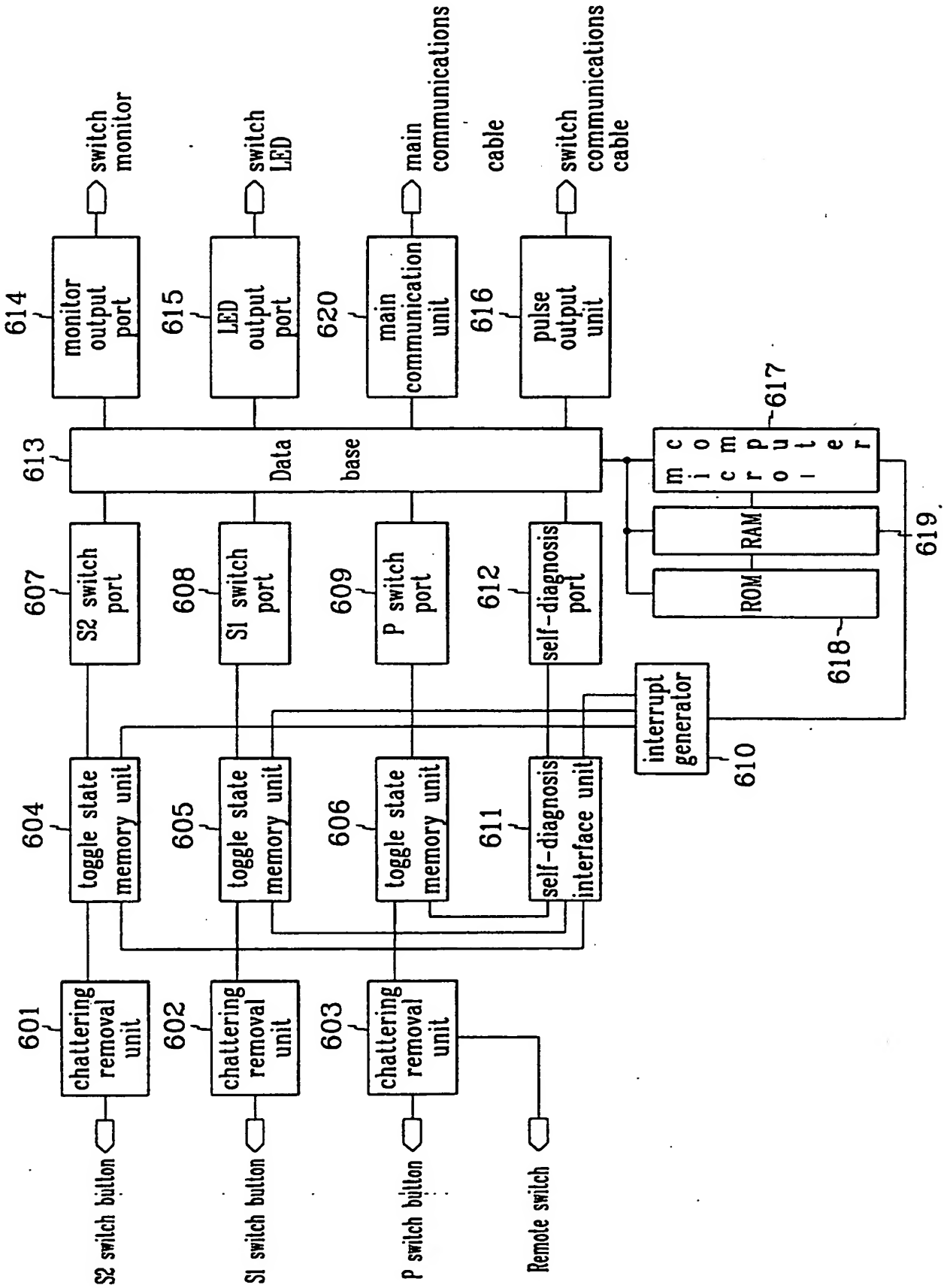

S2 switch button
S1 switch button
P switch button
Remote switch
601 chattering removal unit
602 chattering removal unit
603 chattering removal unit
604 toggle state memory unit
605 toggle state memory unit
606 toggle state memory unit
611 self-diagnosis interface unit
610 interrupt generator
607 S2 switch port
608 S1 switch port
609 P switch port
612 self-diagnosis port
613 Data base
614 monitor output port
615 LED output port
620 main communication unit
616 pulse output unit
switch monitor
switch LED
main communications cable
switch communications cable
617 microcomputer
ROM
RAM
618
619

FIG.35

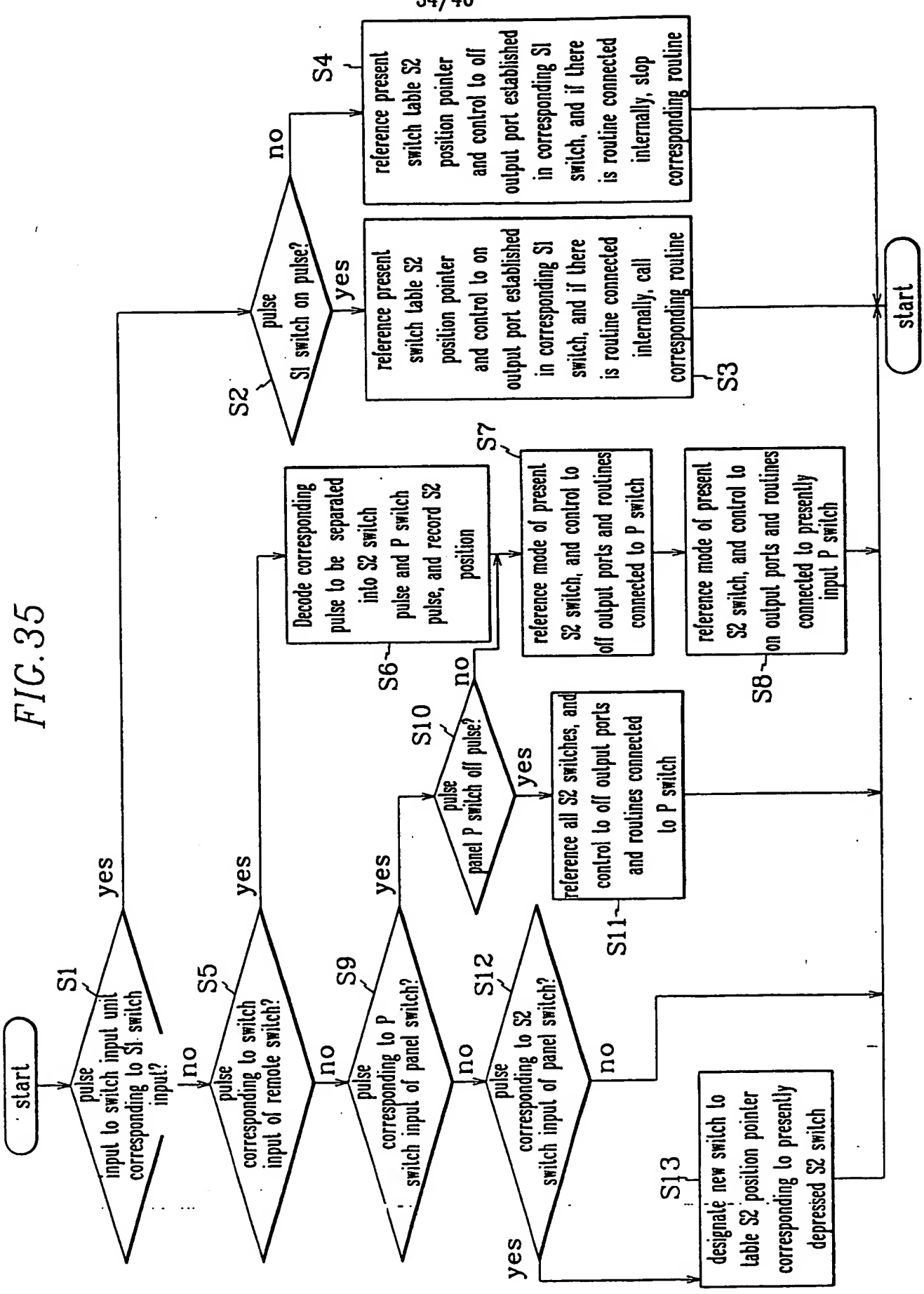

start
S1
pulse input to switch input unit corresponding to S1 switch input?
yes
no
S2
pulse S1 switch on pulse?
yes
no
reference present switch table S2 position pointer and control to on output port established in corresponding S1 switch, and if there is routine connected internally, call corresponding routine
S3
reference present switch table S2 position pointer and control to off output port established in corresponding S1 switch, and if there is routine connected internally, stop corresponding routine
S4
S5
pulse corresponding to switch input of remote switch?
yes
no
Decode corresponding pulse to be separated into S2 switch pulse and P switch pulse, and record S2 position
S6
S7
reference mode of present S2 switch, and control to off output ports and routines connected to P switch
reference mode of present S2 switch, and control to on output ports and routines connected to presently input P switch
S8
S9
pulse corresponding to P switch input of panel switch?
yes
no
S10
pulse panel P switch off pulse?
yes
no
reference all S2 switches, and control to off output ports and routines connected to P switch
S11
S12
pulse corresponding to S2 switch input of panel switch?
yes
no
S13
designate new switch to table S2 position pointer corresponding to presently depressed S2 switch
start

FIG. 36A

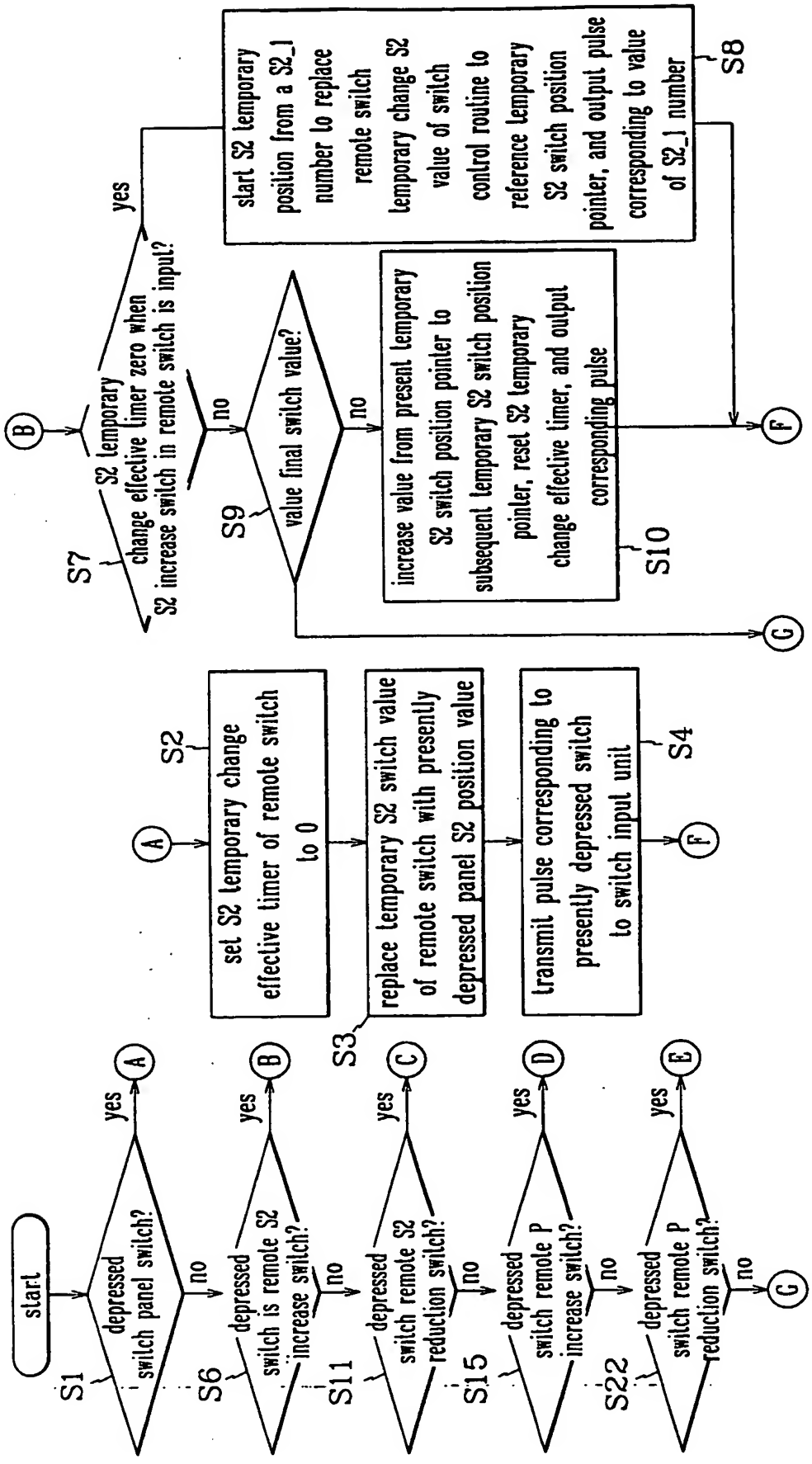

start
S1
depressed switch panel switch?
yes
no
A
S2
set S2 temporary change effective timer of remote switch to 0
S3
replace temporary S2 switch value of remote switch with presently depressed panel S2 position value
S4
transmit pulse corresponding to presently depressed switch to switch input unit
F
S6
depressed switch is remote S2 increase switch?
yes
no
B
S7
S2 temporary change effective timer zero when S2 increase switch in remote switch is input?
yes
no
S8
start S2 temporary position from a S2_1 number to replace remote switch temporary change S2 value of switch control routine to reference temporary S2 switch position pointer, and output pulse corresponding to value of S2_1 number
S9
value final switch value?
no
S10
increase value from present temporary S2 switch position pointer to subsequent temporary S2 switch position pointer, reset S2 temporary change effective timer, and output corresponding pulse
F
G
S11
depressed switch remote S2 reduction switch?
yes
no
C
S15
depressed switch remote P increase switch?
yes
no
D
S22
depressed switch remote P reduction switch?
yes
no
E
G

FIG.36B

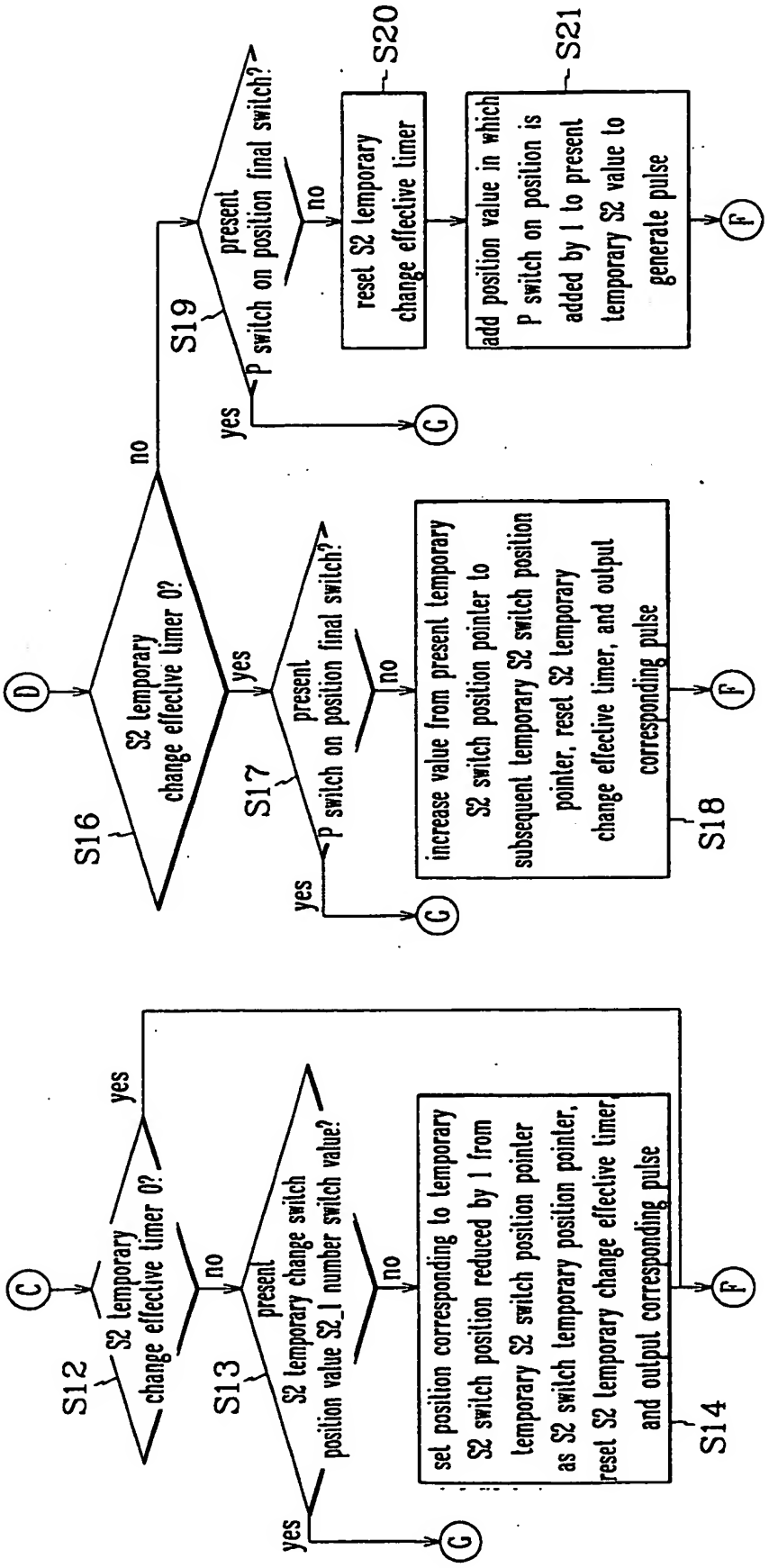

C
S12
S2 temporary change effective timer 0?
yes
no
S13
present S2 temporary change switch position value S2_1 number switch value?
yes
no
set position corresponding to temporary S2 switch position reduced by 1 from temporary S2 switch position pointer as S2 switch temporary position pointer, reset S2 temporary change effective timer, and output corresponding pulse
S14
F
G
D
S16
S2 temporary change effective timer 0?
yes
no
S17
present P switch on position final switch?
yes
no
increase value from present temporary S2 switch position pointer to subsequent temporary S2 switch position pointer, reset S2 temporary change effective timer, and output corresponding pulse
S18
F
G
S19
present P switch on position final switch?
yes
no
S20
reset S2 temporary change effective timer
S21
add position value in which P switch on position is added by 1 to present temporary S2 value to generate pulse
F

FIG.36C

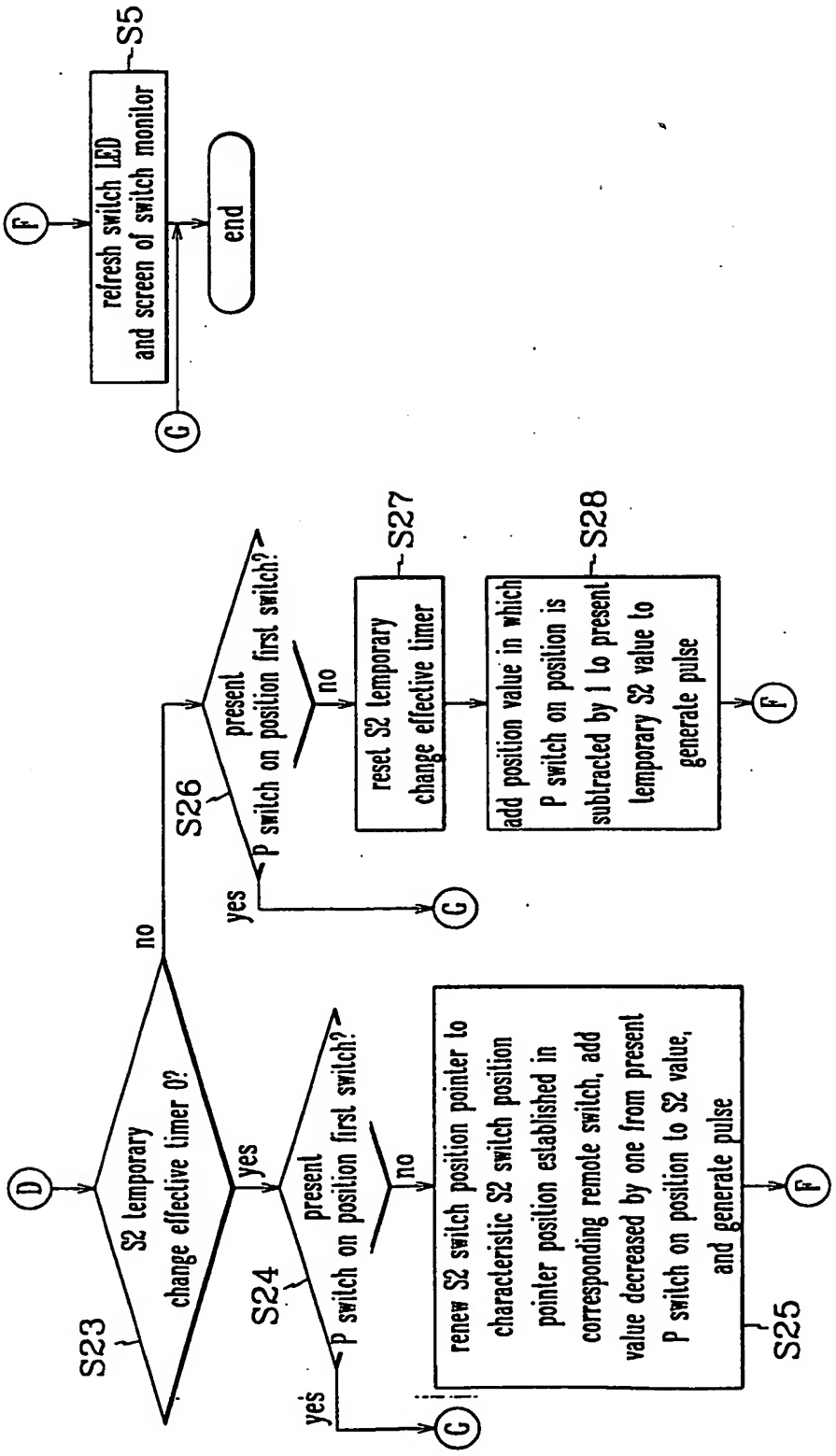

S5
refresh switch LED and screen of switch monitor
end
F
G
S23
S2 temporary change effective timer 0?
no
yes
S24
present P switch on position first switch?
yes
no
renew S2 switch position pointer to characteristic S2 switch position pointer position established in corresponding remote switch, add value decreased by one from present P switch on position to S2 value, and generate pulse
S25
S26
present P switch on position first switch?
yes
no
S27
reset S2 temporary change effective timer
S28
add position value in which P switch on position is subtracted by 1 to present temporary S2 value to generate pulse
D

FIG. 37

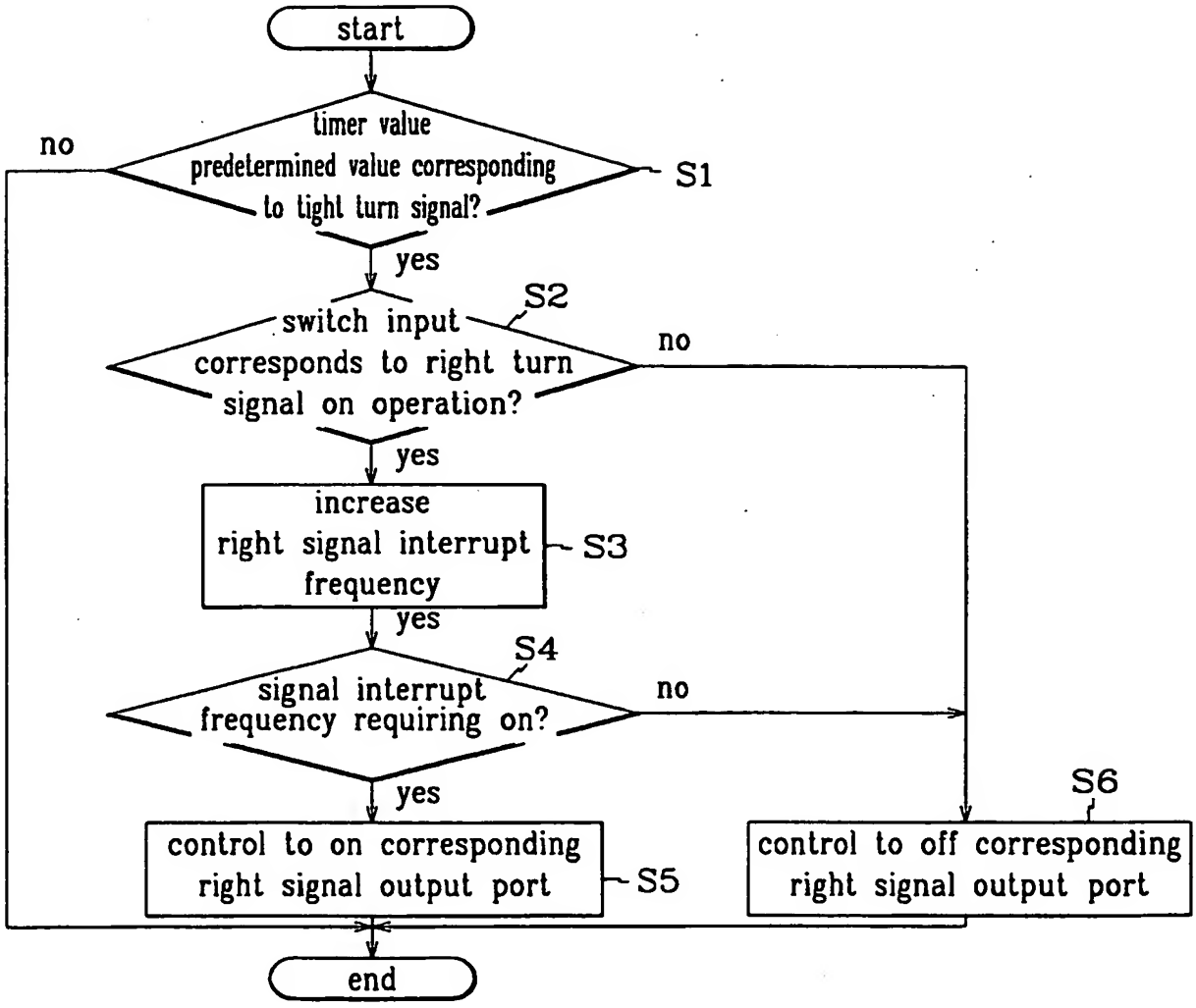

start
timer value predetermined value corresponding to tight turn signal?
S1
no
yes
switch input corresponds to right turn signal on operation?
S2
no
yes
increase right signal interrupt frequency
S3
yes
signal interrupt frequency requiring on?
S4
no
yes
control to on corresponding right signal output port
S5
control to off corresponding right signal output port
S6
end

FIG. 38

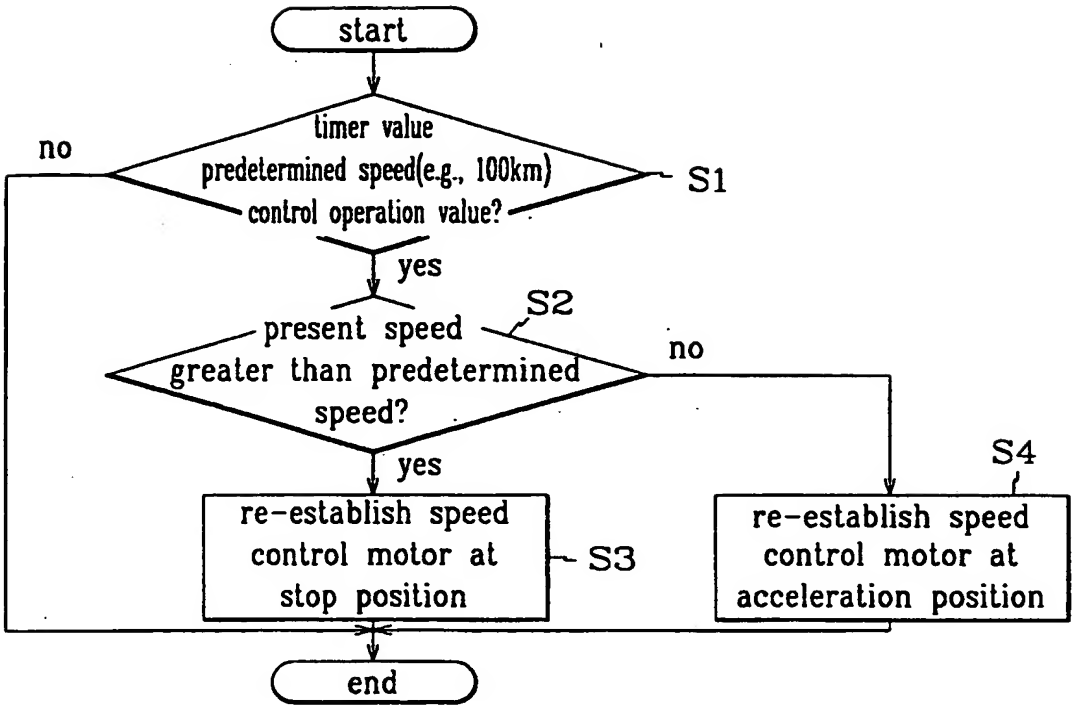
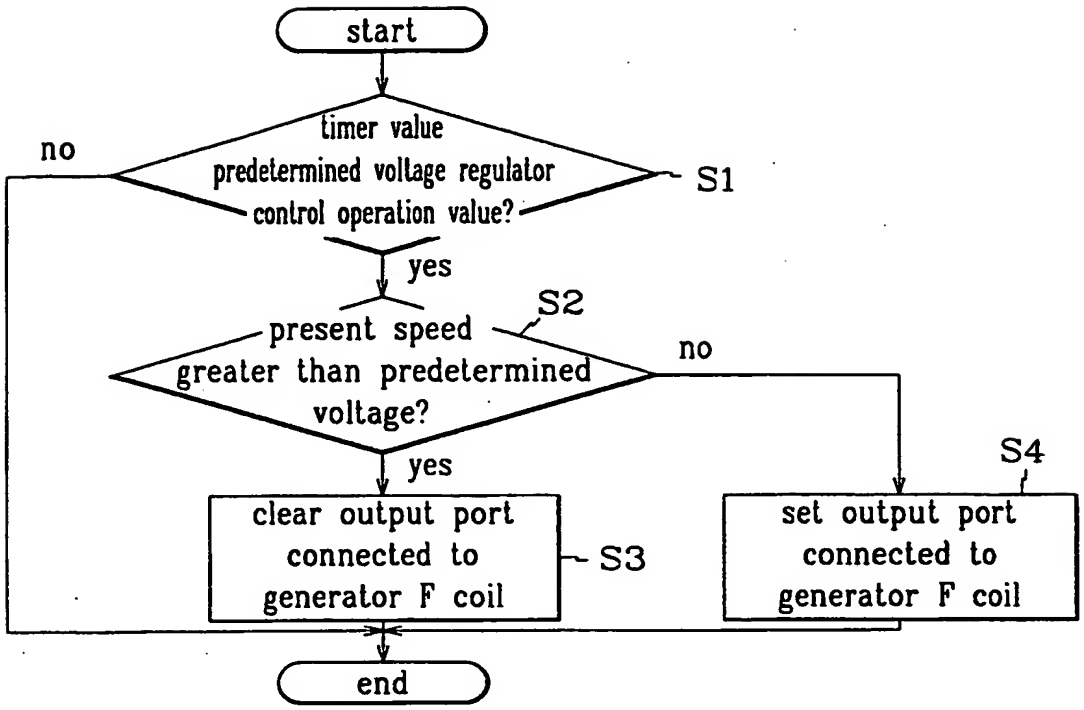

start
timer value
predetermined speed(e.g., 100km)
control operation value?
S1
no
yes
present speed
greater than predetermined speed?
S2
no
yes
re-establish speed control motor at stop position
S3
re-establish speed control motor at acceleration position
S4
end

FIG. 39


start
timer value predetermined voltage regulator control operation value?
S1
no
yes
present speed greater than predetermined voltage?
S2
no
yes
clear output port connected to generator F coil
S3
set output port connected to generator F coil
S4
end